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STATICE IN NORTH AMERICA.

S. F. Blake.

Like its near relative *Limonium*, the genus *Statice*[1] (*Armeria* Willd.) is one of which the taxonomic treatment has been subject to great diversity of opinion, Boissier in 1848 having enumerated fifty-two species, all of which Otto Kuntze in 1891 proposed to reduce to one. The several pre-linnaean species were lumped by Linnaeus in the Species Plantarum into one, *Statice Armeria*, the diagnosis of which ("scapo simplice capitato, foliis linearibus") might even today almost be taken as a generic character. Miller in 1768 and Link in 1801 recognized several European species, and Willdenow in 1809 had nine species of the genus.

In 1814 Pursh[2] recorded *Statice Armeria* as growing "on rocks near the sea-shore: Pensylvania to Virginia. July, Aug. v. v." Torrey[3] soon after remarked that Pursh had "made some mistake respecting the habitat, as there is no 'sea-shore' to Pennsylvania," and, as Pursh never visited any region in America where the Thrift grows as a native, it is clear that his "v[idi] v[ivam]" was based either on some misapprehension or on garden specimens, perhaps escaped. The species was rightly noted by Gray[4] in the first edition of the Manual

[1] The reason for the use of *Statice* L. emend. Mill. in place of *Armeria*, already explained in my revision of American *Limonium* in Rhodora xviii. 55–56 (1916), may be repeated here. Linnaeus's *Statice* included the two groups, but he expressly noted the distinctions of *Statice* and *Limonium* in his observations under the genus, and this action must be taken as indicating the species with rounded heads as the typical group of the genus, and hence as that one for which the name must be retained, in accordance with Article 45 of the International Rules.

[2] Fl. Am. Sept. i. 212 (1814).

[3] Fl. N. & Mid. U. S. i. 329 (1824).

[4] Man. ed. 1. 280 (1848).

as "a native of Northern Canada. . . . but not of the United States," and Pursh's error has in this case not caused the confusion that has resulted from some of his other doubtful records.

The first really satisfactory exposition of the species of *Statice* (*Armeria*) was made by the keen botanist Wallroth [1] in 1844. Its species, of which twenty-seven were recognized, were divided by him into three sections based on the pubescence of the fruiting calyx: *Mastrucatae,* with calyx-tube pubescent between as well as on the ribs; *Barbatae,* with calyx-tube pubescent only on the ribs; and *Calvae,* with tube glabrous. The first two sections were each subdivided according to the nature of the attachment between calyx and pedicel into two groups — *Rostellatae,* with the base of the calyx drawn out into a subacicular beak, and *Truncatae,* in which the point of attachment of the calyx was much shorter, and the calyx-base consequently less prolonged. The American species recognized were three, all described as new: *Armeria labradorica,* the only eastern species, of the *Mastrucatae Truncatae;* and *A. arctica,* based on the *Armeria vulgaris* forma *arctica* of Chamisso, from the Alaskan coast and islands, and *A. sanguinolenta,* from "Sumpfen Nordamerika's," both of the *Barbatae Truncatae.* In Boissier's monograph [2] of *Armeria* in 1848 two primary divisions of the genus were recognized. *Macrocentron,* corresponded in general to Wallroth's two groups called *Rostellatae,* with his *Calvae,* while *Plagiobasis* embraced all the remaining species. The second and much larger section, *Plagiobasis,* including all the American species, was divided into § 1. *Holotrichae,* answering to Wallroth's *Mastrucatae Truncatae,* with calyx pubescent both on and between the ribs, and § 2. *Pleurotrichae,* equalling Wallroth's *Barbatae Truncatae,* with calyx pubescent only on the ribs. Wallroth's three North American species were recognized, and *A. andina* Poepp. *β. californica* was described from California.

Despite their recognition by Boissier, and the fact that by him as by their describer they were considered referable to two distinct sections or subsections, no notice of Wallroth's species seems to have been taken in American botanical literature in the seventy-two years since their publication. Gray [3] in 1878, treating of *Armeria vulgaris* Willd. from North America, described it as having the calyx-tube

[1] Beitr. i. 169–218 (1844).
[2] Boiss. in DC. Prod. xii. 674–689 (1848).
[3] Syn. Fl. ii. pt. 1. 55 (1878).

"10-nerved, hairy at least on the stronger nerves or angles; the lobes blunt or cuspidate," and gave it "in various forms" a range through Arctic America on both coasts and south to California, Europe, northern Asia, Chili, and Patagonia. Later American authors have without exception followed Gray's course in combining the eastern and western forms of our coasts, and in the latest work treating of the genus in North America, Britton & Brown's Illustrated Flora (ed. 2, ii. 719 (1913)), the calyx is described in similar terms.

Reference has already been made to Kuntze's proposed amalgamation of all the fifty or more described species in one, the original *Statice Armeria* L. The slightest consideration of any moderately large collection of the genus is sufficient to show the absurdity of such a course. Although the species are usually closely similar in habit, characters of fair significance and constancy can be found in the size, shape, and pubescence of the leaves, in the size of the head and the nature of the bracts, and occasionally in the pubescence of the stem. It is to the fruiting calyx, however, that one must look for the essential characters not only of sectional subdivision but also of specific discrimination. The constancy of the characters on which the subsections *Holotrichae* and *Pleurotrichae* are based has indeed been called into question by more than one botanist. It was however firmly supported by Boissier, whose knowledge of the genus as a whole has probably not yet been surpassed, and Druce, who has carefully examined the English species as to this feature, states [1] that he has found no evidence of intergradation between the two groups. The very confused state of the material in most herbaria undoubtedly contributes to the belief that the location and amount of the pubescence is subject to variation, but in the apparent absence of proof of this assumption the opinion of Wallroth and Boissier, the two leading monographers of the genus, is not lightly to be disregarded, and the evidence I am about to bring forward, derived from a careful study of the American species, goes far to confirm the validity of the characters on which the groups *Holotrichae* and *Pleurotrichae* are founded.

Careful examination of the material in the Gray Herbarium shows that in every one of the thirty collections of *Statice* from the eastern coast of America (including several from Greenland) the calyx-tube is more or less hairy between the ribs, at least in the neighborhood

[1] Journ. Linn. Soc. Lond. xxxv. 68–70 (1901).

of the oblique rib connecting the intermediate ribs at apex with the main ribs of the calyx, which itself (*i. e.* the cross-rib) is also always hairy; while each of the twenty-two collections from western America, including the area from Kotzebue Sound to Monterey, is absolutely glabrous between the ribs, although these are frequently as hairy as in the eastern species, and the cross-ribs uniting the main and intermediate ribs are likewise always perfectly glabrous. Although no other constant differences have been discovered between the plants of the two areas, the absolute constancy of this feature and its correlation with geographic distribution, in the light of the importance laid upon just this character by Wallroth and Boissier, lead me to consider the plants perfectly distinct. The two western species of the *Pleurotrichae* proposed by Wallroth, however, are not confirmed by the material examined, which is much more extensive than that accessible to him.

Although agreeing in the essential character of pubescence of the calyx-limb, the eastern plants differ somewhat among themselves in regard to the shape of the calyx-lobes, which may be merely acuminate, apiculate, short-cuspidate, or rather long-cuspidate (cusp 0.4–0.5 mm. long). Careful study shows that while the distinction between the long-cuspidate and short-cuspidate forms seems a fairly constant one, no line can be drawn between the short-cuspidate, apiculate, and acuminate forms, all three or gradations between them occurring not rarely on the same calyx. Accordingly it has seemed best to recognize the long-cuspidate form, which best agrees with Wallroth's description of his *A. labradorica,* as varietally distinct from the more varied but entirely intergradient plexus of short-cuspidate to acuminate forms. While the long-cuspidate form, in all the material at hand, is always pubescent on the scape, as described by Wallroth, the other plant occurs in both a glabrous and a pubescent form, although no concomitant characters have been found to distinguish them. It has seemed advisable to give this variation only formal recognition. The three sheets of this variety with merely acuminate or apiculate calyx-lobes from Mount Albert, Quebec, the only known station south of Labrador, agree in having ciliate leaves, all the others being glabrous on the leaves even if puberulous on the scapes, with the exception of a single collection from Labrador.

The western plants, as has been brought to my attention by Prof. Fernald, also show differences among themselves worthy of at least

varietal recognition. The Californian material, distinguishable at a glance by its longer broader leaves and generally taller scapes, has always glabrous leaves with a very blunt sometimes almost truncate tip, naturally more obvious in the broader-leaved specimens but distinguishable in all. In the Alaskan material, on the other hand, the usually much shorter, narrower, and laxer leaves are always more or less ciliate, and the tip is distinctly subulate-pointed. However no absolute line of demarcation exists. In the specimens collected by Bridges (no. 320) and Bolander in California the glabrous leaves are often more or less subulate-pointed; Allen's number 96, from Washington, like Lyall's plants from Vancouver Island, is also more or less intermediate in this respect; and Rosendahl & Brand's 19, from Vancouver Island, although with the stiff glabrous leaves of the Californian plant, is quite intermediate in nature of leaf-tip. While the Alaskan form, in habit and in leaf-apex, thus shows a likeness to the eastern form, its calyx-characters are distinctly those of the Californian plant, with which as has been shown it intergrades, and the two seem best treated as varieties of one species.

The relationship of the Californian plant, which was described by Boissier as a variety of *Armeria andina* Poepp. (*Statice andina* (Poepp.) Rendle), to the latter is quite evident when material of the two is compared. The two collections in the Gray Herbarium (by *C. Gay* and *Reed*) referable to *S. andina* nevertheless show sufficiently marked differential characters from the North American species to make it inadvisable to unite them, particularly when the great gap in their ranges is considered. They have an apparently much longer leafy axis than the Californian plant, and the blunted emarginate calyx-lobes are mucronulate or aristulate from the terminal notch by the prolonged midribs of the lobes. The stem is also strongly pustulose, a feature perhaps of no great consequence but at any rate consistently shown by the South American material in the Gray Herbarium. Although the resemblance between the two is sufficient to indicate the possibility of a genetic relationship in the not very remote past, the present gap in characters and range and the intergradation above demonstrated between the Alaskan and Californian extremes indicate that the latter is best treated as a variety of the Alaskan plant.

KEY TO FORMS.

a. Calyx-tube pubescent between as well as on the ribs; cross-ribs pubescent.
1. *S. labradorica* (Wallr.) Hubb. & Blake.
b. Calyx-lobes long-cuspidate (cusp 0.4–0.5 mm. long) . . Var. *genuina* Blake.
b. Calyx-lobes acuminate to short-cuspidate (cusp 0.2 mm. long or less).
Var. *submutica* Blake.
c. Scape glabrous . . . . . Forma *glabriscapa* Blake.
c. Scape pubescent . . . . . Forma *pubiscapa* Blake.
a. Calyx-tube pubescent only on the ribs; cross-ribs glabrous.
2. *S. arctica* (Cham.) Blake.
b. Leaves ciliate, the apex subulately acutish . . . . . Var. *genuina* Blake.
b. Leaves glabrous, the apex very bluntly rounded.
Var. *californica* (Boiss.) Blake.

1. STATICE **labradorica** (Wallr.) Hubbard & Blake, comb. nov. Root long, slenderly tapering, white within. Scapes 1–7, glabrous or densely shortly spreading-pubescent, 2.8–27 cm. high. Leaves in a dense basal tuft, narrowly linear, shortly subulate-pointed or slightly apiculate, glabrous or rarely ciliate, 1-nerved or the broader 3-nerved, the nerves slightly impressed above, 3.5–8 cm. long, 0.7–1.5 (–2) mm. wide. Heads hemispheric, 1.5–2.1 cm. in diameter. Two outermost bracts lance-ovate, acuminate, scarcely mucronate, glabrous, with brownish center, about 8 mm. long; next three empty, broadly elliptic, mucronate by the excurrent brown midrib at the rounded apex, 8 mm. long, 5 mm. wide. Spikelets 2–3-flowered. Fruiting bract suborbicular-cuneate or -obovate, broadly rounded at the somewhat undulate apex, scarious-membranaceous, very slightly greenish-nerved in middle, with brownish center and often purplish border, 7.5–8.5 mm. long. Pedicels glabrous, short; scar of attachment oblique, ovate. Calyx obconic below, with funnelform limb, 6–7 mm. long; proper tube 3–3.3 mm. long, 10-ribbed, densely ascending-pilose on all the ribs as well as on the cross-ribs (i. e. those connecting the main and intermediate ribs), and more or less densely ascending-pilose between them, at least toward the summit of the proper tube; limb 5-lobed, whitish to pale lavender, scarious, the 5 brown or purplish-brown short-pilose nerves evanescent in the middle of the lobes or running to their apices and prolonged into a cusp; lobes deltoid or lance-deltoid, from acuminate to apiculate, short-cuspidate, or long-cuspidate, about 1.2 mm. long; intermediate teeth truncate, emarginate, or rounded, about 0.3 mm. high. Petals lilac. — *Armeria labradorica* Wallr. Beitr. i. 185 (1844); Boiss. in DC. Prod. xii. 678 (1848). *Statice Armeria* and *Armeria vulgaris* Am. auth., in part.— The above description is drawn to include all variations of the species. This may be divided into the following varieties and formae.

Var. **genuina** Blake, var. nov. Calycis lobi longe (0.4–0.5 mm.) cuspidati. Scapus semper pubescens.— Calyx-lobes with a cusp 0.4–0.5 mm. long. Scape always pubescent.— FIG. 2.— Greenland

and Labrador.—GREENLAND: Netiuleme, Whale Sound, 13 Aug. 1894, *Wetherill* 176. LABRADOR: Netlik Bay, 4 Aug. 1861, *Hayes Expedition* 35; Kangalaksiorvik Bay, Sept. 1908, *O. Bryant;* Nain, 11 Aug. 1897, *Sornborger* 112.

Var. **submutica** Blake, var. nov. Calycis lobi vel acuminati vel apiculati vel breviter cuspidati (cuspide 0.2 mm. longa vel breviore).—Calyx-lobes acuminate, apiculate, or short-cuspidate, the cusp 0.2 mm. long or less.

Forma **glabriscapa** Blake, forma nov. Scapus glaber.—FIG. 1.—Greenland to Newfoundland and Mt. Albert, Quebec.—GREENLAND: Aamhavn, 1870, *Puggren;* Fan Glacier, Inglefield Gulf, 2 Aug. 1894, *Wetherill* 143. LABRADOR: Forteau, 1870, *Rev. S. R. Butler.* NEWFOUNDLAND: limestone barrens, near sea level, Pointe Riche, 4 Aug. 1910, *Fernald, Wiegand, & Kittredge* 3880; serpentine tablelands, Bonne Bay, 380 m., 27 Aug. 1910, *Fernald, Wiegand, & Kittredge* 3879; highest summits of the Lewis Hills, July 1911, *L. S. Sanford;* sandy plains, Coal River, 1896, *Waghorne* 29; Blomidon District, July 1911, *C. C. Stewart* 11; serpentine and magnesian limestone barrens, northern bases and slopes of Blomidon Mts., 24 July 1910, *Fernald, Wiegand, & Kittredge* 3878; serpentine tableland, 550 m., northeast region of the Blomidon Mts., 21 Aug. 1910, *Fernald & Wiegand* 3878a. QUEBEC: Mt. Albert, Gaspé, common above 915 m., 27 July 1881, *J. A. Allen;* very abundant in crevices and detritus of serpentine, especially on open barrens, 900–1050 m., Mt. Albert, 8 July 1905, *Collins & Fernald* 127; serpentine barrens, Mt. Albert, 23 July 1906, *Fernald & Collins* 710 (TYPE in Gray Herb.).

Forma **pubiscapa** Blake, forma nov. Scapus plus minusve dense breviterque patenti-pubescens.—Greenland and Labrador.—GREENLAND: near Cape Acland, Inglefield Gulf, 31 July 1894, *Wetherill* 122; Cape York, 23 July 1894, *Wetherill* 65; Ulugsak near Arveprinsens Ejland, 3 July 1883, *Sylow;* Godhavn, 7 Aug. 1877–78, *Kumlein;* Karsuk, *Rink.* BAFFIN LAND: Nikkerton Islands, 15 July 1877–78, *Kumlein.* UNGAVA: Port Burnell, Hudson Strait, 18 July 1910, *J. M. Macoun* 79392. LABRADOR: Ehortiarsuk, Cape Chudleigh, Aug. 1896, *C. Schmitt* 308; 32 km. north of Narvak, 28 Aug. 1908, *H. S. Forbes;* Rama, July–August 1899, *A. Stecker* 328 (TYPE in Gray Herb.); Hebron, 4 Aug. 1908, *H. S. Forbes;* hills back of Okkak, Aug. 1911, *F. C. Hinckley;* Flint I., near Port Manvers, 22 Aug. 1908, *O. Bryant.*

• Wallroth's *Armeria labradorica* was based on specimens collected by *Sommer* "in den Sumpfen auf Labrador" in 1833. Its relationship with *Statice maritima* Mill. of Europe is undoubtedly close, but I have seen no European specimens exactly matching our plant, and in any case the European species are so confused and so much in need of careful revision that it seems best to adopt for the American plant

Wallroth's clearly applicable name until the whole group can be subjected to the thorough investigation it so urgently requires, material for which can be found only in European herbaria. From the characters given by Wallroth ("Frucht. . . . .sowohl an den hervorstehenden Rippen als an den Zwichenfeldern fein beharrt. Die Fruchtkrone fast von der Länge der Frucht, rundlich and kurz gelappt und mit eben so kurzen Grannen versehen," or as given in the Latin diagnosis, "fructibus obovatis breviter pedicellatis mastrucatis, pappi lobis ovatis subaristatis") it seems highly probable that the specimens collected by Sommer are referable to my first variety, which is accordingly designated var. *genuina*.

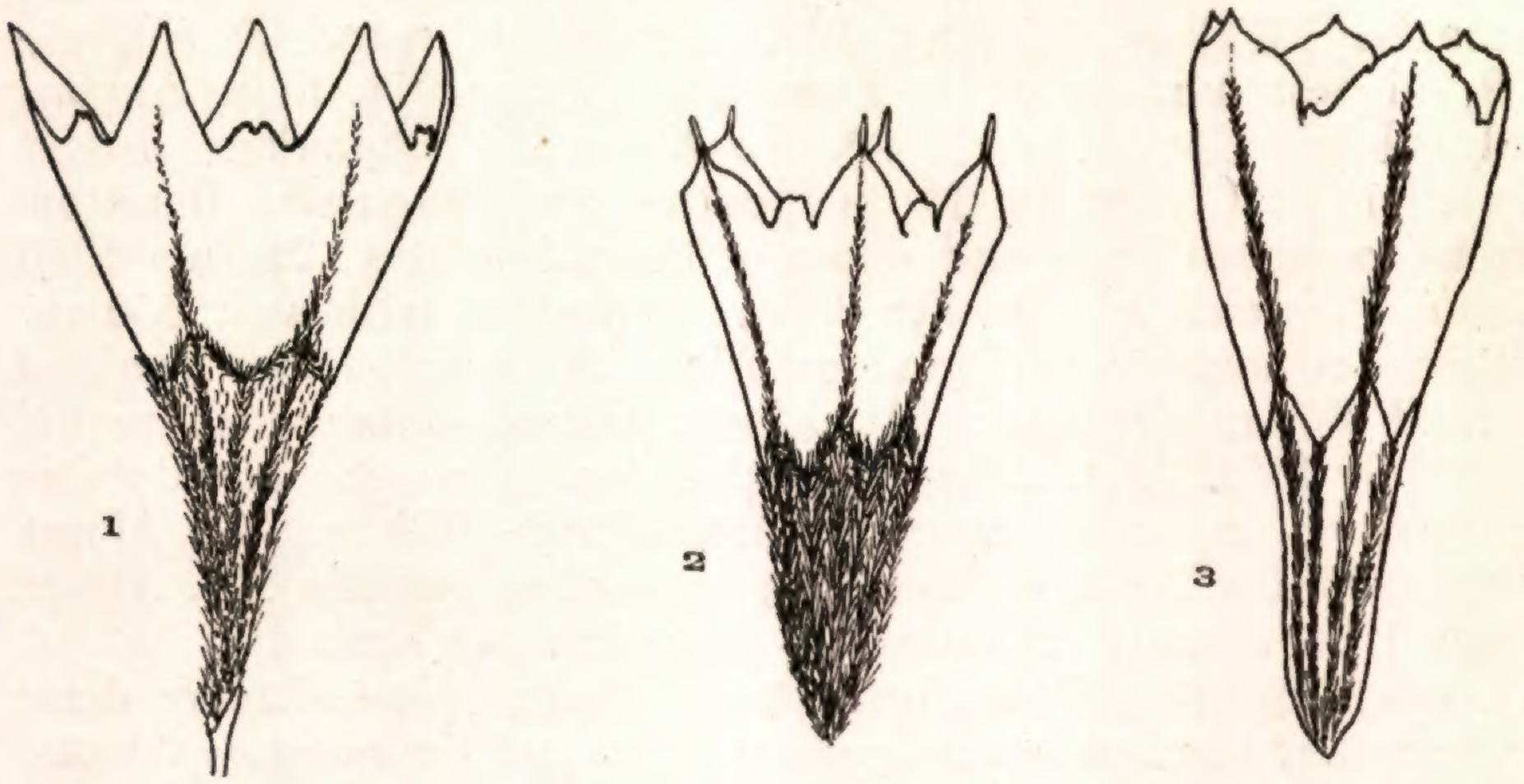

FIG. 1.— *Statice labradorica* (Wallr.) Hubbard & Blake var. *submutica* Blake forma *glabriscapa* Blake (*Fernald & Collins* 710).
FIG. 2.— *S. labradorica* var. *genuina* Blake (*Sornborger* 112).
FIG. 3.— *S. arctica* (Cham.) Blake var. *californica* (Boiss.) Blake (*Baker* 2851). All × 7.

2. STATICE **arctica** (Cham.) Blake, comb. nov. Root as in the last or thicker, pinkish in section. Scapes 1–6, erect, slender or stoutish, always glabrous, more or less glandular-punctate, 12–52 cm. high. Leaves in a dense basal tuft, linear, rounded or blunt at apex, or sublately acutish, enlarged below into the scarious-margined base, glabrous or ciliate, 1–3(–sub-5)-nerved, (3–)5–20 cm. long, 0.8.–3(–4.5) mm. wide. Heads hemispheric, 1.6–2.5 cm. thick. Outer bracts three, ovate to oblong-ovate, oblong-lanceolate, or rarely lanceolate, acute, scarcely mucronate, scarious-margined, 6–13 mm. long, 3.5–5 mm. wide, glabrous. Sterile bracts about seven, rotund-elliptic, rounded at apex, not mucronate, broadly scarious-margined, 9–12 mm. long, 4.5–5.5 mm. wide. Spikelets 3-flowered. Fruiting bract elliptic-cuneate, broadly rounded at apex, not mucronate, scarious, nerved in middle below, ca. 11 mm. long, 6.5 mm. wide. Bractlets (each subtending a flower) broadly oval, rounded at apex, scarious, 6 mm.

long or less. Pedicels glabrous, 3.5 mm. long or less; scar of attachment oblique, obovate-fusiform. Calyx 6.5–7 mm. long; proper tube obconic, 10-ribbed, the ribs pilose with spreading-ascending hairs, the interspaces and cross-ribs entirely glabrous; limb funnelform, 5-nerved, the nerves shortly pilose; lobes about 1 mm. long, depressed-deltoid, abruptly apiculate or mucronulate, rarely retuse, the nerve evanescent near middle or continuing to apex, the tooth or mucro 0.2–0.4 mm. long; intermediate teeth obsolescent or absent. Petals lilac.— *Armeria vulgaris* Willd. forma *arctica* Cham. Linn. vi. 566 (1831). "*A. vulgaris* E. *humilis* forma *arctica* Ebel, De Armer. Diss. 31 (1840)," fide Wallr. l. c. *A. arctica* Wallr. Beitr. i. 193 (1844); Boiss. in DC. Prod. xii. 679 (1848). *A. sanguinolenta* Wallr. l. c. 207 (1844); Boiss. l. c. 682 (1848). *A. vulgaris* and *Statice Armeria* Am. auth., in part.— Two varieties may be recognized.

Var. **genuina** Blake, var. nov. Folia ciliata apice subulato-acutiuscula.— Alaska to British Columbia and Washington.— ALASKA: Kotzebue Sound, *Bongard, Arnott* (*Beechey's Voyage*), 1881, *Muir* 58; Cape Nome, 1900, *Blaisdell;* Unga I., 2 July 1872, *Harrington;* Igognak I., Unalaska, 12 Sept. 1873, *U. S. Coast Survey;* Arakamtchetchene I., Bering Sts., 1853–56, *C. Wright;* St. Paul I., *Elliott*, 28 July 1891, *J. Macoun*. BRITISH COLUMBIA: Vancouver I., 1858, *Lyall*. WASHINGTON: prairie, Roy, 13 May 1899, *O. D. Allen* 96. Lyall's and Allen's plants show some approach in leaf-tip to the next variety. *Rosendahl & Brand* 19, from crevices of slate rock, District of Renfrew, Vancouver Island, is intermediate in leaf-tip but has the glabrous leaves of var. *californica*.

Var. **californica** (Boiss.) Blake, comb. nov. Folia glabra apice late rotundata vel subtruncata, quam in var. *genuina* saepe latiora et longiora.— *Armeria andina* Poepp. *β. californica* Boiss. l. c. 678 (1848). — Fig. 3.— CALIFORNIA: hills near San Francisco, 8 April–1 May, *Bigelow;* common on ridges, sandhills near San Francisco, 3 May 1903, *C. F. Baker* 2851; Oakland, *H. Mann* 21; near Monterey, *Hartweg* 1927; Monterey, 1–15 June 1903, *G. Newell;* Pacific Grove, July 1891, *Michener & Bioletti* 194; along beach, Pacific Grove, 30 April 1903, *Heller* 6641; without locality, *Bridges* 320, *Brewer* 650, *Bolander, Coulter*, 577.

In this species as in *S. labradorica* hexamerous calyces occasionally occur. The Unga Island specimen collected by Harrington is decidedly aberrant, having a 6-lobed calyx with merely blunt or even emarginate lobes, but is connected by Muir's Kotzebue plant with the normal form.

It may be well to call attention to the fact that the differences shown in the figures are, with the exception of those mentioned in the text, entirely individual and in no way diagnostic of the forms represented.

STOUGHTON, MASSACHUSETTS.

THE GENUS ELATINE IN EASTERN NORTH AMERICA.

M. L. FERNALD.

IT has become customary to treat all Elatine from the margins of ponds and streams in eastern America as *Elatine americana* (Pursh) Arn.,—to such an extent that local botanists rarely examine the details of the plants. During the past summer, however, while exploring the tidal reaches of the lower Kennebec system in Maine, Mr. Bayard Long and the writer were much interested in a peculiar prostrate and matted Elatine which was found in great abundance in the tidal mud of Cathance River at Bowdoinham. The plants of these tidal flats differed somewhat in appearance, the smaller plants having the leaves cuneate-obovate to oblong and sessile, the larger plants having the mostly larger leaves more broadly obovate and petioled. A detailed study of this material, as well as all the specimens in the Gray Herbarium, the herbarium of the New England Botanical Club, and of the Academy of Sciences of Philadelphia (including the herbarium of the Philadelphia Botanical Club) shows that we have in the Atlantic states and eastern British America three quite distinct species of the genus, distinguished not only in the form of the foliage but in the floral characters and in the shape, size and markings of the seed.

The commonest plant is the small species in sandy, gravelly or peaty pond-margins with rather small cuneate-obovate to oblong sessile leaves. In this plant the flowers are dimerous, having two sepals, two petals and two stamens. The seed is comparatively thick and more or less barrel-shaped, with rounded ends, 0.5–0.7 mm. long and 220–280 μ thick. The seed has distinct longitudinal ribs and between them 15–18 obtuse cross-ribs marking off somewhat rectangular reticulations. This plant, the commonest species in eastern America, was well described and illustrated by Nuttall as *Crypta minima*[1] from "gravelly banks of the Delaware overflowed by the tide." The plant is well illustrated with two sepals, two petals and two stamens, and the type material, now preserved in the herbarium of the Academy at Philadelphia, has the very characteristic seed of the common plant of sandy and gravelly shores. This species, which Nuttall thought

[1] Nuttall, Journ. Acad. Sci. Phil. i. 117, t. 6, fig. 1 (1817).

might be the same as Pursh's *Peplis americana* but which is apparently quite distinct from Pursh's plant, although commonly occurring in fresh sandy and gravelly shores, occasionally extends into wet clay and even into the borders of salt marshes, although it is apparently rare in these extreme habitats.

The plant which is more distinctive of brackish or tidal mud, the plant with petioled obovate leaves, has a trimerous flower, with three sepals and three petals, and is undoubtedly the plant intended by Pursh as his *Peplis americana*, which was described, "foliis crassis spathulato-obovatis", and which was "inundated during its flowering time, in slow-flowing places of rivers, in Pensylvania."[1] The habitat, it is true, is so similar to that of Nuttall's later published *Crypta minima* that it was quite natural for Nuttall to assume that his plant and Pursh's were identical, but Nuttall's species had dimerous flowers, while Pursh's plant of inundated shores was put by him into the Linnean group *Hexandria*, where he certainly would not have placed a plant with dimerous flowers.

The plant with petioled obovate leaves, which occurs on the tidal flats of Cathance River in Maine and on the tidal flats of the Delaware, as well as at a few other stations along the Atlantic coast, has very definitely three sepals and three petals, although the writer has been unable to determine with complete satisfaction (owing to the maturity of specimens) whether the stamens are three or six. In view, however, of the occurrence of this plant with trimerous flowers and obovate leaves on the tidal flats of the Delaware River, there is little doubt that it is the plant intended by Pursh as *Peplis americana*. This plant, which is identified with Pursh's species and which was afterwards called *Elatine americana* by Arnott, differs from *Crypta minima* (Nuttall) Fischer & Meyer in having the seeds ordinarily curved and decidedly more slender, ranging from 140–190 μ in diameter and with the longitudinal ribs much more irregular and obscure and connected by 20–30 acute cross-ribs.

The third plant of the Atlantic slope is a well known species of Europe, *E. triandra* Schkuhr, which has the trimerous flowers and essentially the seed of true *E. americana* but which has thin linear, elongate-lanceolate or lance-spatulate, often toothed leaves, and which often grows to a height of 2 dm. with long internodes, in these

[1] Pursh, Fl. Am. Sept. i. 238 (1814).

characters being quite unlike either of the other eastern American plants. The only known station in the Atlantic states for *E. triandra* is at Skowhegan, Maine, where it was collected in October, 1914, by Miss Louise H. Coburn from the bottom of a small pond in the park, In response to a letter from the writer Miss Coburn collected additional material on October 28, 1916, and wrote in regard to the station: "The pond is a natural bog-hole, enlarged and shaped for the Park and has been planted with water-lilies, which came from the Mount Desert Nurseries, Bar Harbor, and a few from Farquhar & Co. of Boston and Dedham."

Whether or not *Elatine triandra* is indigenous in Maine waits to be determined. The species is certainly indigenous in Yellowstone Lake and at other very remote points in the Rocky Mountain region, although there is grave doubt as to the identity of the plant reported under this name from Illinois. The species is common in Europe and it is not impossible that it was introduced with roots of nursery stock into the pond at Skowhegan. The question whether it is indigenous in New England can be determined only by finding it at other stations which have not been altered or planted to foreign plants.

By way of summary and in order to check the herbarium specimens seen, the following synopsis is appended. The specimens examined are in the Gray Herbarium and the herbaria of the New England Botanical Club and of the Academy of Sciences at Philadelphia.

A. Seeds slender-cylindric, usually curved, 140–190 μ thick, with 20–30 acute cross-ribs between the irregular or obscure longitudinal ribs: flowers 3-merous. *B.*

B. Leaves obovate to broadly spatulate, with rounded summits.

ELATINE AMERICANA (Pursh) Arnott, Edinb. Journ. Nat. & Geogr. Sci. i. 431 (1830). *Peplis americana* Pursh, Fl. Am. Sept. i. 238 (1814).— Forming prostrate mats becoming, when fully developed, 0.6–2 dm. broad; the subascending branchlets 1–5 cm. long: leaves 3–8 mm. long, 1–4.3 mm. broad (in dried specimens): sepals 3: petals 3: stamens (?) 3 or 6.— Chiefly, if not always, in wet clay, locally from Quebec to Delaware and eastern Pennsylvania. QUEBEC: on mud, Hull, October, 1890, *J. Macoun:* near Hull, October 4, 1904, *J. Macoun,* Herb. Geol. Surv. Can. no. 76,922. MAINE: tidal mudflats of Cathance River (best developed on open mud of small tributary brooks and rills), September 14 and 19, 1916, *Fernald & Long,* no. 14,107. CONNECTICUT: muddy border of Cartwheel Pond, Southington, August 22, 1900, *C. H. Bissell;* muddy shore of pond, Maltby Park, Orange, October 10, 1873, *F. W. Hall* (plants with

unusually expanded red petals); muddy shore of pond, out of water for some time, Huntington, August 16, 1899, *E. H. Eames*. NEW JERSEY: along Crosswicks Creek, Bordentown, Burlington Co., July 15, 1916, *Long*, nos. 6049, 6062; shores of Delaware River, Camden, September, 1877, *Martindale;* tidal mud of Delaware River, Camden, October 7, 1877, *C. F. Parker;* shores of Delaware near Cooper's Point, September 15, 1858, *W. W. Wister*. PENNSYLVANIA: banks of Delaware, Andelusia, August, 1866, *Martindale;* mud island in Delaware near Andelusia, August, 1898, *C. S. Williamson;* in tidal mud of Delaware, Richmond, Philadelphia, October 11, 1868, *E. D.*; tidal mud about the mouth of the Schuylkill and Tinicum, Delaware County, August 2, 1865, *C. E. Smith*. DELAWARE: Brandywine Creek by the Rolling Mill and Railroad Bridge, Wilmington, 1863, *Canby;* muddy banks of Brandywine Creek, Wilmington, July 16, 1865, *A. Commons;* tidal muddy banks of Brandywine between the high and low water marks, Wilmington, October 18, 1873, *A. Commons;* Noxontown Pond near Middletown, Newcastle County, August 16, 1908, *E. B. Bartram;* shore, two miles southeast of Middletown, August 16, 1908, *VanPelt & Long*.

B. Leaves linear to linear-spatulate, truncate or emarginate at tip.

E. TRIANDRA Schkuhr, Bot. Handb. i. 345, t. 109b, fig. 2 (1791). — Less matted; the ascending branches up to 2 dm. long: leaves 0.4–1.2 dm. long, 1–2 mm. broad.— Eurasia; lakes and ponds of Maine and the Rocky Mountain region, little known in America. The only eastern material seen is from MAINE: bottom of little pond in the Park, Skowhegan, October 15, 1914, October 28, 1916, *Louise H. Coburn*.

A. Seeds thick-cylindric or barrel-shaped, mostly straight, 220–280 μ thick, with distinct longitudinal ribs and 15–18 obtuse cross-ribs: flowers 2-merous.

E. MINIMA (Nutt.) Fisch. & Meyer, Linnaea, x. 73 (1836). *Crypta minima* Nutt. Journ. Acad. Phila. i. 117, t. 6, fig. 1 (1817). *E. Clintoniana* Peck, Rep. Reg. Univ. N. Y. xxii. 52 (1869).— Creeping, forming small mats rarely 1 dm. broad; the erect or strongly ascending branchlets 0.2–5 cm. high: leaves cuneate-obovate to oblong, sessile or obscurely petioled, rounded at summit, 0.7–5 mm. long, 0.3–3 mm. broad: sepals 2: petals 2: stamens 2.—On sandy, peaty or more rarely muddy shores and in shallow waters, Newfoundland to Virginia and Minnesota. NEWFOUNDLAND: shallow water, sandy margin of pond, Whitbourne, August 8, 1911, *Fernald & Wiegand*, no. 5853; clay bottoms, small ponds among the hills back of Birchy Cove (Curling), August 11, 1910, *Fernald & Wiegand*, no. 3710. MAINE: submersed at sandy margin of Pennamaquan River, Pembroke, August 18, 1909, *Fernald*, no. 1875; border of Mill Pond, Somesville, July 28, 1892, *E. L. Rand*, September 20, 1892, *Fernald;*

emersed and submersed, gravel at margin of Chickawaukie Pond, Rockland, August 22, 1909, *Fernald*, nos. 1873, 1874; in mountain pond, Mexico, September, 1894, *Kate Furbish;* abundant on muddy shore of Messalonskee River, Waterville, September 2, 1898, *Fernald*, no. 2607; in 1 m. of water, Great Pond, Belgrade, August 31, 1898, *Fernald*, no. 2623; less common than *E. americana* on tidal mud-flats of Cathance River, Bowdoinham, September 14 and 19, 1916, *Fernald & Long*, no. 14,104; border of salt marsh, Back River Creek, Woolwich, September 15, 1916, *Fernald & Long*, no. 14,105; sandy bottom of Sand Pond, Baldwin, August 30, 1916, *Norton, Fernald & Long*, no. 14,107; abundant in shallow margin of Bauneg Beg Pond, North Berwick, September 25, 1897, *Parlin & Fernald.* NEW HAMPSHIRE: sandy shores of Gilmore Pond, Jaffrey, July 20, 1898, *Robinson*, no. 498; shore of Emerson Pond, Rindge, August 17, 1912, *F. F. Forbes.* MASSACHUSETTS: wet sand, border of Haggett's Pond, Andover, September 15, 1882, *E. & C. E. Faxon*, September 24, 1899, *Rich, Williams;* sandy beach of Wenham Lake, Wenham, September 11, 1913, *Fernald, Hunnewell & Long*, no. 9935; Flax Pond, Lynn, August, 1880, *H. A. Young;* Sluice Pond, Lynn, August 22, 1880, *E. & C. E. Faxon;* Spot Pond, Melrose, September 29, 1880, *E. & C. E. Faxon;* submerged margin of Spot Pond, Stoneham, September 29, 1880, *E. & C. E. Faxon*, August 19 and October 6, 1894, *Rich;* wet sandy or peaty margin of Winter Pond, Winchester, September 22, 1908, *Fernald*, October 5, 1913, *Fernald & Long*, no. 9936; sandy margin of Heard's Pond, Wayland, September 10, 1909, *Fernald;* Learned's Pond, South Framingham, August, 1874, *C. E. Faxon;* shallow water near sandy margin of Cooper's Pond, Carver, August 30, 1913, *Fernald, Hunnewell & Long*, no. 9931; in shallow waters of pond, Plymouth, August 26, 1913, *S. N. F. Sanford;* damp sandy beaches of Great South Pond and Boot Pond, Plymouth, September 6, 1913, *Fernald, Hunnewell & Long*, nos. 9932, 9933; sandy borders of small ponds, Bourne, September 15, 1901, *Kennedy, Williams & Fernald* in *Plantae Exsiccatae Grayanae*, no. 23; Nine Mile Pond, Centreville, Barnstable, September 4, 1898, *Williams, Greenman*, no. 425; shallow waters near margins of small sand-bottomed ponds west of White Pond, Chatham, September 9, 1913, *Fernald & Long*, no. 9934; Nonquitt, August 1890, *E. W. Hervey;* pond, Nantucket, August, 1897, *L. L. Dame;* Maxcy's Pond, Nantucket, August 12, 1905, *Churchill;* sandy beach of Wallum Pond, Douglas, October 29, 1911, *Fernald;* margin of Bass Pond, sand plains, Springfield, August 27, 1913, *Bissell & Weatherby;* edge of Goose Pond, Tyringham, July 27, 1911, *R. Hoffmann.* RHODE ISLAND: "In Republica Insulae Rhodiensis," *Thurber & Calder;* Apponaug Pond, August 26, 1880, *E. & C. E. Faxon;* Tiverton, August 18, 1877, *J. C. Phelps;* Sands Pond, Block Island, August 18, 1892, *Bailey & Collins;* peaty ponds and pools between Pilot Hill and Southeast Point, Block Island, August 20, 1913, *Fernald, Hunnewell & Long*, no. 9930. CONNECTI-

CUT: shallow water of Prospect Reservoir, Prospect, September 1, 1912, *A. E. Blewitt*, no. 1549; Middlebury, August 28, 1896, *W. M. Shepardson;* shallow water and shores of Lake Quinnipaug, North Gilford, August 19, 1906, *G. H. Bartlett;* New Haven, September 16, 1879, *J. A. Allen;* Lake Saltonstall, September 23, 1880, *E. & C. E. Faxon*. NEW YORK: rocky shore of Bowman's Pond, Sandlake, Rensselaer County, July and August, 1868 (?), *C. H. Peck* (duplicate type of *E. Clintoniana* Peck); lake, Averill Park, Rensselaer County, September, 1883, *J. H. Wibbe;* submerged in shallow water, sandy bottom of White Lake, Forestport, Oneida County, July 22, 1904, *Haberer*, no. 2741; Albany, *A. Gray;* shores of Lake Mahopac, Putnam County, August, 1898, *J. Carey;* Long Island, *J. Torrey*. NEW JERSEY: pond near Milton, Morris County, August 2, 1904, *C. S. Williamson;* north shore of Spring Lake, Monmouth County, September 15, 1907, *C. S. Williamson;* in water, shore of Maxon's Pond, Point Pleasant, Ocean County, July 7, 1910, *Van Pelt & Brown*, no. 271; Bay Head, Ocean County, August 8, 1908, *E. B. Bartram;* Toms River at Island Heights, August 19, 1892, *J. R. Churchill;* margin of Delaware above William Cooper's Ferry, *S. N. Conrad;* shores of Delaware, Camden, September, 1877 (mixed with *E. americana*) *Martindale*. PENNSYLVANIA: banks of the Delaware overflowed by the tide, West Kensington, July, 1817 (?) *Nuttall* (type of *Crypta minima*); tidal mud about the mouth of the Schuylkill and Tinicum, Delaware County, August 2, 1865 (material mixed with *E. americana*), *C. E. Smith*. MARYLAND: sandy shores of Wicomico River near Salisbury, September, 1863, October, 1864, *Canby*. VIRGINIA: Alexandria, *A. H. Curtiss*. MINNESOTA: Linn Lake, Chisago County, August, 1872, *B. C. Taylor*.

GRAY HERBARIUM.

A NEW AGROPYRON FROM CAPE BRETON.

F. TRACY HUBBARD.

AGROPYRON **acadiense**, sp. nov. Glaucissimum, stoloniferum; rhizomata squamigera pallide brunnea. Culmi solitarii vel pauci, glabri, 2–6.5 dm. alti, nodis (3) valde constrictis flexilibusque; innovationes duae vel plures, culmis molto breviores. Vaginae basilares plures, glabrae, nonnullae elaminatae; illae culmorum laeves glabraeque marginibus aliquando breve ciliatis exceptis, inferiores purpureorosae internodia circum aequantes vel etiam ea (saltem apud innovationes) superantes, superiores internodiis breviores, ad oram laminae

vaginis auriculatis angustiores. Ligulae circa 0.5 mm. longae, membranaceae erosaeque. Laminae e basi plus minus planato involutae, 5–16 cm. longae, basi ad 3 mm. latae, valde patentes rigidaeque, infra glabrae laevesque, supra in nervis scabrae marginibus praecipue basin versus barbulatis. Inflorescentia compacta e vagina superiore plus minus exserta, aliquando a folio subtendente superata, 4–8.5 cm. longa ad 1 cm. lata; rachi internodiis superioribus exceptis fere glabro. Spiculae 1.2–1.5 cm. longae, lateraliter compressae, paullum divergentes, 3–5-florae; glumae duas tertias spiculorum longitudine aequantes, glabrae, inferior 7-nervata, circa 8 mm. longa, carina apicem acutiusculum versus barbulata, superior 5-nervata, circa 9 mm. longa, carina apicem acutiusculum vel minute mucronulatum versus barbulata; lemmata glabra, 5-nervata, ad apicem in subulam ad 4 mm. longam dorso barbulatam abrupte contracta, circa 1–1.2 cm. longa; paleae 2-carinatae carinis barbulatis, quam lemmata breviores, ad apicem minute ciliolatae, truncatae paullum retusatae.

Very glaucous with a long, scaly, pale brown rootstock: culms solitary or few to a clump, 2–6.5 dm. tall, 3-noded, glabrous; nodes much constricted and flexible when fresh; innovations two to several, much shorter than the culms; basal sheaths several, glabrous, some of them bladeless; those of the culms smooth and glabrous except the sometimes short-ciliate margins, the lower purplish-pink, about equalling or exceeding the internodes (those of the innovations longer than the internodes), the upper shorter than the internodes, all auriculate and contracted to the blade at the throat: ligules about 0.5 mm. long, membranaceous and erose: blades involute from a flattened base, 5–16 cm. long, 3 mm. broad at base, strongly spreading and rigid, lower surface glabrous and smooth, upper surface scabrous on the nerves, margins barbulate especially toward the base: inflorescence compact, more or less exserted from the upper sheath, sometimes exceeded by the subtending leaf, 4–8.5 cm. long, up to 1 cm. broad, the rachis almost glabrous except the upper internodes which are slightly barbulate: spikelets 1.2–1.5 cm. long, laterally compressed, slightly divergent, 3–5-flowered; glumes about $\frac{2}{3}$ as long as the spikelets, inferior 7-nerved, about 8 mm. long, barbulate on the keel toward the acutish apex, superior 5-nerved, about 9 mm. long, barbulate on the keel toward the acutish or minutely mucronulate apex; lemmas glabrous, abruptly narrowed to a subulate tip which is up to 4 mm. long and barbulate dorsally, about 1–1.2 cm. long; paleas 2-keeled, with the keels barbulate, shorter than the lemmas, truncate and slightly notched at the minutely ciliolate apex.—NOVA SCOTIA: dry sandy beach of Bras d'Or Lake, Grand Narrows, Cape Breton, July 20, 1914, *Fernald & St. John* in *Plantae Exsiccatae Grayanae* (TYPE in Gray Herb.), also Grand Narrows, July 27, 1898, *John Macoun*, Herb. Geol. Surv. Can. no. 21,030, distributed as *A. occidentale*.

Allied to *A. Smithii* Rydb. from which it differs in the constricted and flexible nodes of the culm, the more involute blades which are

never more than scabrous above, the almost wholly glabrous rachis, the fewer-flowered and smaller spikelets and in the glumes which are acutish or short-mucronulate instead of acuminate. It also somewhat resembles *A. pungens* (Pers.) R. & S. from which it differs in the narrower, more involute and slightly shorter leaves, the less dense and not four-sided inflorescence and the fewer-flowered, somewhat less compressed spikelets.

Boston, Massachusetts.

A NEW JUNCUS FROM CAPE COD.

M. L. Fernald.

Juncus **pervetus**, n. sp., radicibus, rhizoma, culmis et foliis ut apud *J. Roemerianum;* culmis teretibus vel compressis rigidis rectis vel tortis 0.6–1 m. altis; inflorescentiis terminalibus vel pseudolateralibus supra compositis 2.5–10 cm. longis 2.5–6.5 cm. diametro, ramis rigide adscentibus vel divergentibus; capitulis 10–30-floris subsphaericis segregatis; floribus circa 2 mm. longis interdum unisexualibus; sepalis petalisque subaequalibus pallide fuscis vel albescentibus oblongis obtusis membranaceo-marginatis, sepalis subcarinatis; staminis 6 interdum abortivis, filamento antheram aequante; fructo exserto 3 mm. longo ovato-prismatico subulato-attenuato nitido stramineo vel rufescente, placentis non crassatis; seminibus 0.4–0.6 longis anguste obovoideis apice obtuse mucronatis basi breviter albido-caudatis.

Roots, rhizome, culms and leaves as in *J. Roemerianus:* culms terete or compressed, rigid, erect or twisted, 0.6–1 m. high: inflorescences terminal or falsely lateral, much branching, 2.5–10 cm. long, 2.5–6.5 cm. in diameter; branches rigid, ascending or divergent: heads 10–30-flowered, subspherical, scattered: flowers about 2 mm. long, sometimes unisexual: sepals and petals subequal pale-fuscous or whitish, oblong, obtuse, with membranaceous margins; sepals somewhat carinate: stamens 6, sometimes wanting; filaments equaling the anthers: fruit exserted, 3 mm. long, ovate-prismatic, subulate-attenuate, shining, stramineous or rufescent; the placentae not thickened: seeds 0.4–0.6 mm. long, narrowly obovoid, bluntly mucronate at apex, with a short white caudate appendage at base.— Massachusetts: brackish swale, Hyannis, August 29, 1909, *E. W. Sinnott* (distributed as *J. articulatus*, var. *obtusatus*); forming a dense swale for a few rods only at the peaty upper border of a brackish marsh, east side of Lewis Bay, Yarmouth, October 14, 1916, *M. L. Fernald & F. K. Butters*, no. 15,064 (type), also in *Plantae Exsiccatae Grayanae.*

It is not improbable that Dr. Sinnott's station is identical with ours, the plant being excessively local and seen during three days of exploration only on one marsh, very near the Sinnott cottage in West Yarmouth, at the outskirts of the village of Hyannis.

In many characters resembling *J. Roemerianus* which, however, differs in the following essential points: more lax inflorescence with the heads only 2–6-flowered; perianth 3–3.5 mm. long, with acute sepals; filaments much shorter than the anthers; capsule only about equaling the perianth, obtuse and merely mucronate; placentae thickened; seed 0.75 mm. long, without caudate appendage at base.

Juncus pervetus is one of the many remarkable species of world-wide affinities which are being so frequently discovered on the coastal area of southern New England and southeastern British America. It belongs to a unique subgenus, *Junci thalassii* of Buchenau, characterized by rigid texture, usually bladeless lower sheaths, culm-like rigid pungent cauline leaf with continuous pith (not septate), and very branching usually rigid inflorescences bearing the flowers in heads. Thus, to compare these plants with familiar examples, they combine the habital characteristics of *J. balticus* or *J. effusus* with those of *J. militaris*. This unique subgenus has, besides the newly discovered *J. pervetus*, six species all of saline or subsaline habitats and with a disrupted range which indicates that they are remnants of an ancient group. *J. acutus* L. or one of its varieties occurs in the Atlantic and Mediterranean regions of Europe and northern Africa, the coasts and steppes of southwestern Asia, the Atlantic Islands (Madeira, Azores, etc., and Bermuda), Cape of Good Hope, the coast of California, southern Brazil, Uruguay, Argentina, Chile and the Islands of Juan Fernandez off the coast of Chile. *J. Cooperi* Engelm. is known only from saline regions of California and Nevada; *J. Roemerianus* only on the coast from Virginia to Texas; *J. austerus* Buchenau only from Chile; and *J. Kraussii* only from South Africa; while *J. maritimus* Lam. is widely but interruptedly dispersed: on the Atlantic and Mediterranean coasts of Europe, southwestern Asia and northeastern Africa, Cape of Good Hope, the Azores, Bermudas, Brazil, Australia, Tasmania and New Zealand, with its only station on the North American coast on Coney Island, New York.

It is thus evident that *J. pervetus* belongs in a subgenus of highly localized and presumably ancient species which were once widespread but are now reduced to scattered and often quite dissociated areas. That the plant is excessively local on Cape Cod will be evident from

the fact that, having detected the species in Dr. Sinnott's collection, now in the Herbarium of the New England Botanical Club, the writer and other members of the Club spent two days in June last, in the neighborhood of Hyannis with the plant especially in mind but without detecting it; later, in September, ten members of the Club watched without success for it during a two-day field-trip; on October 7 and 8, Messrs. Butters, St. John and the writer devoted two long days to a systematic search for it in many of the brackish swales in southern Barnstable and Yarmouth without success and on October 14, when the plant was finally found, it was in only one very limited station, a few rods long and perhaps a rod wide at the upper margin of a marsh, where the deeply creeping tough rootstocks extended on the one side into brackish or even saline marsh, on the other into acid peat. In this very restricted station, however, the plant was so prolific as quite to exclude all other species from the limited area.

We now know on the Atlantic coast of North America three of the seven species of the *Junci thalassii* (four if we include *J. acutus*, var. *Leopoldii* of Bermuda); two of them from only a single restricted station each: *J. maritimus* on Coney Island; *J. pervetus* on Cape Cod. That other stations along the Atlantic seaboard should be expected is apparent and it is hoped that this extended notice may result in their discovery. In the past *J. acutus*, *J. maritimus* and *J. Roemerianus* have been credited to the coast of New Jersey, but the status of these plants in New Jersey is thus summarized by Dr. Witmer Stone.

"We can find no New Jersey specimens of *J. maritimus* or *J. roemerianus*, and their inclusion in the New Jersey flora seems to rest wholly upon a statement of Pursh (Fl. Amer. Sept. I. 235. 1814). He gives '*Juncus acutus* on the sandy seacoast New Jersey, &c.' In the first edition of Gray's Manual this record is quoted under *Juncus maritimus*, while in the fifth edition and earlier in Trans. St. Louis Acad. II. 439, 1866, Engelmann shows that the *J. maritimus* of American authors is really *J. roemerianus*, which he continues to cite from New Jersey. Prof. M. L. Fernald, who corroborates the above, also calls my attention to this statement by Englemann (Trans. St. Louis Acad. II. 490) — 'The New Jersey locality rests on the doubtful authority of Pursh; I have seen no specimens collected farther north than Wilmington, N. C.' As no one has found it in the State subsequently, I think we may safely expunge it from the list."[1]

[1] Stone, Pl. so. N. J. 330 (1912).

Now that we know on the south side of Cape Cod a unique relative of *Juncus maritimus* and *J. Roemerianus* it seems not impossible that Pursh really saw some member of this group on the New Jersey coast, although the station may now be obliterated. The stations of *J. maritimus* on Coney Island and of *J. pervetus* on Cape Cod are both so very limited that only a very mild degree of "improvement" would quickly obliterate the former from the flora of North America while the latter would as quickly become an extinct species.

GRAY HERBARIUM.

A FORM OF SOLIDAGO SEMPERVIRENS WITH WHITE RAYS. — Late in the season of 1915 there were brought to me two or three plants of the seaside golden rod the rays of which were creamy white, practically the same color as in *Solidago bicolor*. As these were gathered quite near the water at high tide, it seemed to me more than likely that the whiteness was the result of the spray dashing over the plants, although it is true that I did not find signs of it on the leaves.

This year (1916) I had an opportunity to examine the plants where they grow. They are at Isle au Haut, Maine. The particular colony where I have found the white-rayed form is composed of two hundred to two hundred and fifty plants, and the plants with the white rays grow mostly at one end of the patch, but they are scattered amongst the common yellow form in a way that precludes the possibility of spray having anything to do with the whiteness. Perhaps ten per cent of all the plants in this colony show the white rays.

This may be common elsewhere, but it has never happened to come to my notice. I should be glad to hear whether others have found the same form.— NATHANIEL T. KIDDER, Milton, Massachusetts.

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BOTANICAL ACTIVITIES OF PERCIVAL LOWELL.

C. S. Sargent.

That Percival Lowell took an active interest in trees was probably not known to many persons, for he published only one botanical paper and he had no botanical associates except in this Arboretum. It is not surprising that a man with his active and inquiring mind brought up in New England should, when he found himself in Arizona, want to know something of the strange plants which grew everywhere about him and which were so entirely unlike the plants which he had known as a boy in Massachusetts, and later in Japan and Korea. The love of plants, too, was in his blood and only needed the opportunity of this new field to make itself felt.

Percival Lowell's great great grandfather, John Lowell, was one of the original members of the Massachusetts Society for Promoting Agriculture and its second President, serving from 1796 until his death in 1802. He is less well known for his connection with rural affairs than his son John Lowell, spoken of generally in his day as "the Norfolk farmer," and a generous and successful promotor of scientific agriculture and horticulture in Massachusetts, whom Daniel Webster called "the uniform friend of all sorts of rural economy." The second John Lowell became a member of the Agricultural Society in 1816 and served from the time of his election until 1830 as its Corresponding Secretary, and as one of the editors of its publication, *The Massachusetts Agricultural Repository and Journal.* During these years articles by him on agriculture, horticulture and forestry are found in almost every number. In volume v. published in 1819 there is an important paper by John Lowell on "The Gradual Diminu-

tion of the Forests of Massachusetts, and the importance of early attention to some effectual remedy, with extracts from the work of M. Michaux on the Forest Trees of North America." Volume vii. contains articles from his pen on "Some slight notice of the Larch tree (*Pinus Larix*), known in various parts of the country under the several names of Juniper, Hackmatack, and Larch"; on "Fruit Trees," signed by the Norfolk Gardener, and on "Raising the Oak from the Acorn and the best way of doing it." The last volume of this publication which appeared in 1832, when he was seventy-one years old, contains an article by John Lowell on "The Extraordinary Destruction of the last Year's Wood in Forest Trees and the probable Causes of it;" and on "Live Hedges for New England." The second John Lowell was active in establishing and maintaining the Botanic Garden of Harvard College and was one of the original members of the Massachusetts Horticultural Society. To the first annual festival of the Horticultural Society held in the Exchange Coffee House on State Street, September 19, 1829, he sent from his greenhouses in Roxbury Orange-trees covered with flowers and fruit and a bunch of grapes weighing three pounds.

John Amory Lowell, the son of the second John Lowell and the grandfather of Percival Lowell, was deeply interested in botany and in 1845, thirty years after his graduation from Harvard College, began the collection of an herbarium and botanical library with the purpose of devoting himself seriously to the study of plants. He had made valuable collections and a large botanical library when the financial troubles of 1857 forced him to abandon botany and devote himself again to business affairs. His most valuable books were given by him to his friend Asa Gray and now form an important part of the Library of the Gray Herbarium. His herbarium and his other botanical books were given to the Boston Society of Natural History. John Amory Lowell, like his father and grandfather, was a member of the Massachusetts Society for Promoting Agriculture. He was succeeded by his son John Lowell, who in turn was succeeded by his son, another John Lowell, who of the fifth generation in direct descent from its second President is now a Trustee of this Society.

Percival Lowell's love of plants certainly came to him naturally. I first met him in the Arboretum many years ago examining the collection of Asiatic Viburnums in which he was interested at that time, but it was not until 1910 that he began to send specimens to the

Arboretum, including that of an Oak which he had found growing near his observatory and which so far as it is possible to judge is an undescribed species. Interest in this Oak led him to look for other individuals and to extend his botanical explorations. During these he visited Oak Creek Canyon, a deep cut with precipitous sides in the Colorado plateau which heads about twenty miles south of Flagstaff and carries in its bottom a small stream which finally finds its way into the Verde northwest and not far from Camp Verde. Lowell appears to have been the first botanist who visited the upper part, at least, of this Canyon where he found a number of interesting plants, notably *Platanus Wrightii* and *Quercus arizonica*, which before his explorations were not known to extend into the United States from Mexico beyond the canyons of the mountain ranges of southern Arizona and New Mexico. In Oak Creek Canyon Lowell found a new Ash-tree somewhat intermediate between *Fraxinus quadrangulata* of the east and *F. anomala* of our southwestern deserts which will bear his name. Later Lowell explored Sycamore Canyon which is west of Oak Creek Canyon and larger and deeper than Oak Creek Canyon and, like it cuts through the Colorado plateau and finally reaches the Verde near the mouth of Oak Creek.

Juniperus in several species abounds on the Colorado plateau, and Lowell became deeply interested in these trees and was preparing to write a monograph of our southwestern species. His observations on the characters and altitudinal range of the different species, illustrated by abundant material, have been of great service to me.

Lowell's only botanical paper, published in the May and June issues of the *Bulletin of the American Geographic Society* in 1909, is entitled "The Plateau of the San Francisco Peaks in its Effect on Tree Life." In this paper, which is illustrated by photographs made by the author of all the important trees of the region, he discusses the altitudinal distribution of these trees, dividing his region into five zones which he illustrates by a number of charts showing the distribution of vegetation in each. It contains, too, an important and interesting discussion of the influence on temperature and therefore on tree growth of the larger body of earth in a plateau as compared with a mountain peak where, on account of greater exposure, the earth cools more rapidly.

A bundle of cuttings of what is probably a new species of Willow, to obtain which Lowell had made a long and hard journey, with his

last letter and a photograph of the Willow, came only a few days before the telegram announcing his death. Botany therefore occupied his thoughts during his last days on earth.

The death of Percival Lowell is a severe loss to the Arboretum. He understood its purpose and sympathized with its efforts to increase knowledge. Few collectors of plants have shown greater enthusiasm or more imagination, and living as he did in what he has himself described as "one of the most interesting regions of the globe" there is every reason to believe that as a botanist Percival Lowell would have become famous.

ARNOLD ARBORETUM.

THE GENUS ERECHTITES IN TEMPERATE NORTH AMERICA.

M. L. FERNALD.

WHILE botanizing in October last along the sandy strand on the south side of Cape Cod, Messrs. F. K. Butters, Harold St. John, and the writer found a characteristic Erechtites which seemed unusual on account of its very fleshy foliage and the very broadly ovoid and abruptly acuminate heads. A few specimens were collected for further examination, at Hyannis on October 7, at Yarmouth on October 8; and after returning to Cambridge the writer was surprised to find that in its very long inflated achenes and in some other characters the strand plant was quite unlike *E. hieracifolia*. Consequently, with Professor Butters he returned to the Cape and on October 14th made a further examination and collection of the strand plant, which in all its characters maintains the distinctions noted in the original collections. The plant seems to be a very well marked species which is here proposed as

ERECHTITES **megalocarpa**, n. sp., ab *E. hieracifolia* differt foliis subcarnosis; capitulis ovoideis abrupte acuminatis; involucro 1.5–2 cm. alto, bracteis lanceolatis subobtusis ad basim dilatatam 1–3 mm. latis; corolla floris perfectae brunneo-lineata, lobis brunneo-marginatis nervatisque, tubo viride; acheniis 4–5.5 mm. longis brunneis vel

olivaceis glabris vel paulo strigosis 16–20 costatis, plus minusve inflatis ad apicem versus annulo albido munitis ex quo basis styli persistens protrudit; receptaculo denudato 1–1.2 cm. diametro.

Differing from *E. hieracifolia* in its somewhat fleshy leaves: heads ovoid, abruptly acuminate: involucre 1.5–2 cm. high; its bracts lanceolate, obtusish, 1–3 mm. broad at the dilated base: corolla of the perfect flower with brown lines; the lobes with brown margin and mid-nerve; the tube green: achenes 4–5.5 mm. long, brown or olive, glabrous or a little strigose, 16–20-ribbed, more or less inflated, toward the apex bearing a white annulus (formed by the bases of the pappus-bristles) from which protrudes the persistent style-base: denuded receptacle 1–1.2 cm. in diameter.— MASSACHUSETTS: upper border of sandy sea-beach, Hyannis, Barnstable, October 7, 1916, *Fernald, Butters & St. John,* no. 15,467; upper and middle regions of sandy sea-beach, West Yarmouth, Yarmouth, October 8, 1916, *Fernald, Butters & St. John,* no. 15,468 (TYPE in Gray Herb.) also October 14, 1916, *Fernald & Butters* in *Plantae Exsiccatae Grayanae.*

In the course of this study it has become apparent that *Erechtites hieracifolia* is a very polymorphous plant and that much tropical American material referred to it belongs clearly to some other species. In the eastern United States and Canada the plant although apparently all of one species is very variable, so much so that it is difficult to reconcile the ordinary descriptions with many of the specimens. Thus we find in standard descriptions that the upper leaves are, as described by Gray, "commonly with auriculate partly clasping base";[1] or by Small, "sessile and partly clasping."[2] Yet if we consult Rafinesque's original treatment of Erechtites we shall find that he had but one species, the type of the genus, *E. praealta,* accurately described, as abundant specimens show, "foliis alternis sessilibus basi attenuatis,"[3] and said to have "some similarity of habit, &c. with *Senecio hieracifolius* L."[3] It was not until twenty years later, and then by proxy,[4] that Rafinesque admitted the Linnean *Senecio hieracifolius* with auriculate-based partly clasping leaves to the genus *Erechtites.*

That the Linnean *Senecio hieracifolius* had auriculate-based clasping leaves is quite clear from the plate of Hermann's *Senecio Africanus* [corrected by Linnaeus to *americanus*] *altissimus Blattariae vel Hieracii folio,*[5] from which Linnaeus derived his specific name; and the

[1] Gray, Syn. Fl. i. pt. 2, 396 (1886).
[2] Small, Fl. S. E. U. S. 1300 (1903).
[3] Raf. Fl. Ludov, 65 (1817).
[4] *E. hieracifolia* (L.) Raf. in lit. in DC. Prodr. vi. 294 (1837).
[5] Herm. Par. ed. 2, 226, t. 226 (1705).

same character of the leaves is emphasized in the other citations given by Linnaeus, in which we find the significant phrase: "foliis amplexicaulibus." [1] These two plants, *Erechtites hieracifolia* (L.) Raf. and *E. praealta* Raf., are in their involucres and achenes clearly extremes of one species, but so different in foliage that they should be designated as forms or varieties.

True *E. hieracifolia* has the broad-based auriculate more or less clasping leaves scarcely decreasing in size into the inflorescence and is beautifully shown in Hermann's plate. The commonest variation of the species, at least as indicated by herbarium-representation, is neither the large-leaved typical form nor *E. praealta* but a plant with the upper leaves sessile and broad at base but very rapidly decreasing to small bracts below the inflorescence.

Although found through broad ranges these three rather pronounced variations do not seem to coincide in their distribution, at least in the Northeast. Typical *E. hieracifolia* is apparently common near the coast in southern New England, extending north along the larger valleys to central Maine, central New Hampshire, and the Champlain Valley, and west locally to Illinois. The intermediate variety, with broad-based but greatly reduced upper leaves, is apparently the commonest and most widespread, occurring from Texas to South Carolina and north to Ontario, Quebec and Prince Edward Island; while the plant with the upper leaves attenuate to base or even petioled, *E. praealta* Raf., described from Louisiana, extends eastward to Florida and north to Indiana, Ohio and southern Maine. As at present known the three plants seem to have somewhat different ranges and they are, therefore, here treated as geographic varieties.

To summarize, our species and varieties of *Erechtites* may be distinguished as follows:

Heads subcylindric, only slightly gibbous at base: bracts of the involucre linear, with a slender attenuated tip, 0.5–1.5 mm. broad at the scarcely dilated base: corolla of the perfect flower not brown-lineate; its tube pale straw-color: achenes 2–3 mm. long, not inflated, with 10–12 pale ribs and strigose brown furrows; the terminal annulus (formed by the bases of the pappus-bristles usually without a beak (the persistent style-base) protruding from the center: denuded receptacles 5–8.5 mm. in diameter.

1. *E. hieracifolia.*

Heads ovoid, abruptly acuminate, strongly gibbous at base (when fresh): bracts of involucre lanceolate, subobtuse, 1–3 mm. broad at the dilated

[1] L. Sp. Pl. ii. 866 (1753).

base: lobes of the corolla of the perfect flower with brown borders and midribs; the tube green; achenes 4–5.5 mm. long, inflated, with 16–20 ribs and glabrous or slightly strigose furrows; the annulus with a distinct beak protruding from the center: denuded receptacles 1–1.2 cm. in diameter. 2. *E. megalocarpa*.

1. E. HIERACIFOLIA (L.) Raf. in DC. Prodr. vi. 294 (1837).—Three varieties.

Upper leaves with broad sessile or somewhat clasping bases.
Leaves scarcely decreasing in size into the inflorescence...Var. *typica*.
Upper leaves rapidly reduced to bracts below the inflorescence.
Var. *intermedia*.
Upper leaves attenuated to base or petioled.....Var. *praealta*.

Var. **typica**. *Senecio hieracifolius* L. Sp. Pl. ii. 866 (1753).—Central Maine to Illinois, south to Connecticut, and presumably southward.

Var. **intermedia**, n. var. foliis caulinis gradatim minoribus, superioribus valde reductis vel bracteiformibus sessilibus basi latis.—Prince Edward Island to South Carolina, west to western Ontario, Kansas and Texas. TYPE: Cumberland, Rhode Island, September 13, 1903, *E. F. Williams* (Gray Herb.).

Var. **praealta** (Raf.), n. comb. *E. praealta* Raf. Fl. Ludov. 65 (1817).—Southern Maine to Florida, west to Indiana, southern Illinois and Louisiana.

2. E. MEGALOCARPA Fernald. See above.

GRAY HERBARIUM.

A VARIETY OF SPARTINA NEW TO NEW ENGLAND.—Recently in working over some grasses from the herbarium of William Boott, a collection long ago acquired by the Gray Herbarium, I found a specimen of *Spartina alterniflora* Lois. var. *glabra* (Muhl.) Fernald (RHODORA, xviii. 178) from Middlesex County, Massachusetts, collected presumably near Medford. It was labeled Medford Turnpike, September, 1852, in Boott's handwriting. As this variety seems not to have been previously reported north of Virginia this considerable extension of range seems worthy of record.—F. TRACY HUBBARD, Boston, Massachusetts.

NOTES ON RARE NEW YORK STATE PLANTS.

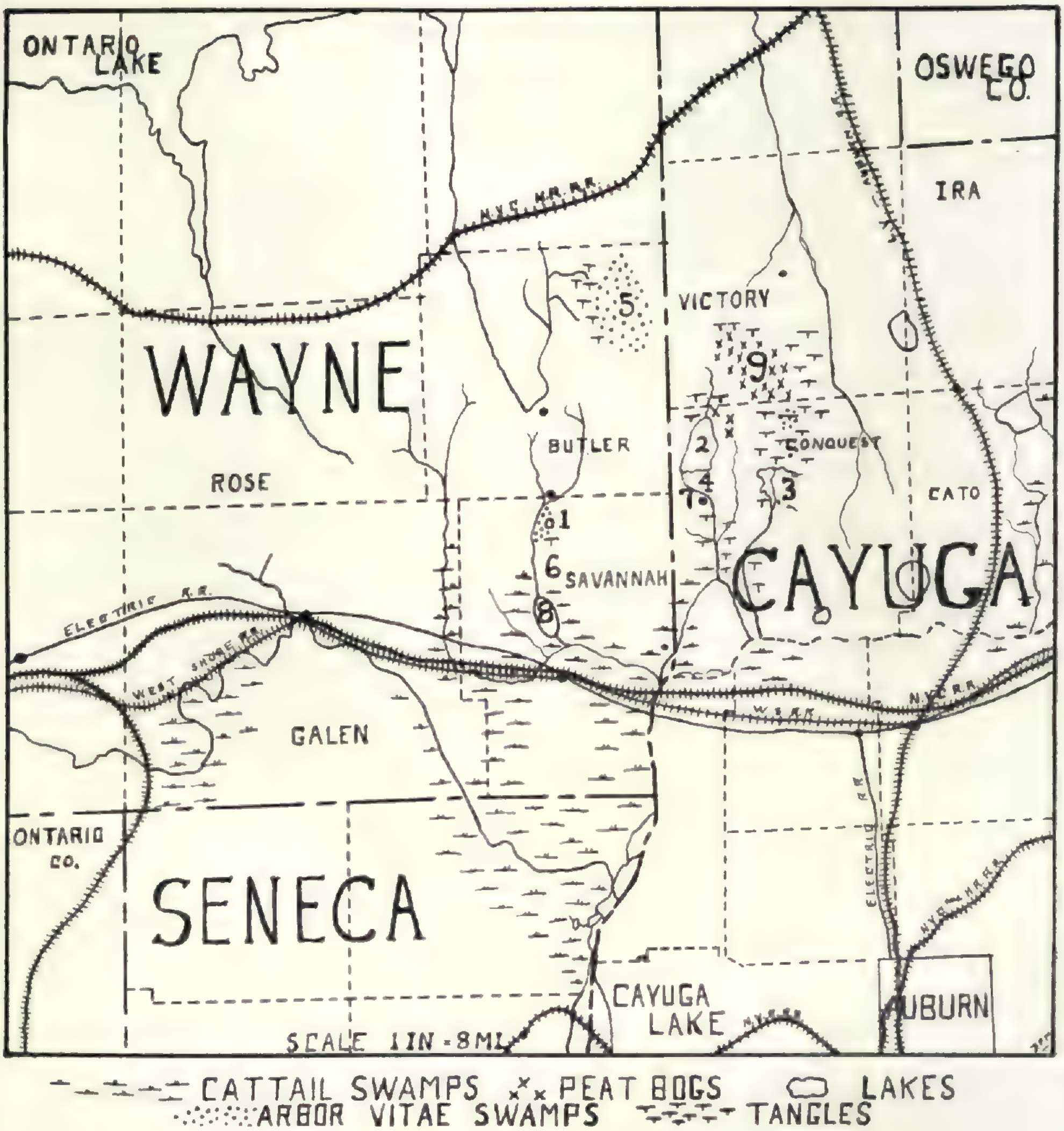
F. P. Metcalf and L. Griscom.

The territory covered by these notes lies partly in Wayne and partly in Cayuga County, New York, roughly speaking about twenty miles north of Lake Cayuga. This region geologically is a plain which extends from Fort Niagara on the west to Oswego on the east, reaching back to the foothills of the inland plateau south of Syracuse and Buffalo. At one time this was entirely covered by the old Lake Iroquois. It is a drumlin country. Chains of small lakes or ponds are everywhere in the hollows, surrounded by swamps or prairies; sphagnum bogs are frequent; and where the ground is a little higher an unusual type of low rich woods is found, affording a rich collecting ground to the botanist. Two types of country not found in the Cayuga Lake Basin (to the south) are the open peaty prairie and the arbor-vitae swamp.

This region has proved to be exceedingly rich botanically. We venture to say that there are few places in the State where twenty-five species of orchids can be found in a few square miles of country as the result of three trips in one summer. Indeed on August 12, 1916, the writers observed twenty species of this interesting group. Fortunately for the botanist, the lack of large towns, and cities, has served to preserve the native flora to a remarkable extent. It is interesting to note that as would naturally be expected from its given position and topographical characteristics, the flora of this region bears a much greater similarity to that of Rochester and Buffalo than to that of the Cayuga Lake Basin.

Quite by chance this region was first visited by Prof. A. H. Wright and the junior author in June, 1915. No plants were collected, but the richness of the flora was so evident that careful exploration was planned for the following year. Accordingly Prof. Wright, Mrs. Wright, and the authors collected there extensively from June 9–13, 1916, bringing back nearly one hundred sheets of rare plants. On this as tangible evidence of the interest of the region, Prof. Wiegand and several other members of the botanical department of the State College of Agriculture collected there from July 1–4, Prof. Wright and the senior author serving as guides; and Prof. Wright and the authors also collected from Aug. 11 to Aug. 14.

This paper, therefore, embodies primarily the striking results of these collections. For the sake of brevity, it has seemed best to treat each plant-association separately, rather than to give a narrative account, trip by trip. All plants mentioned are rare as compared with their occurrence in the Cayuga Lake Basin proper further south.



MAP OF REGION DESCRIBED.

(1) Turtle Pond with Arbor Vitae Swamp — (2) Duck Lake, (3) Mud Pond, (4) Botrychium Woods N. of Spring Lake, (5) Westbury Prairie and Arbor Vitae Swamp, (6) Crusoe Prairie, (7) Miller's Bog, (8) Crusoe Lake, (9) Featherbed Bog.

Acknowledgments are due Prof. Wiegand for checking our identifications and for much assistance and advice in the preparation of this paper. To Prof. Wright of the Department of Zoölogy, our thanks are

warmly extended for the loan of rare local floras, invaluable cooperation in the field, and an enthusiasm which no circumstances or conditions could dampen.

The more interesting plant-associations are discussed in the following paragraphs, lack of time and study preventing a closer analysis. These association-types are so well known that it has seemed unnecessary to name the plants characteristic of each. Only the rarer ones are mentioned. At the end of the paper, detailed records are given for the rarer species, where the distribution of these throughout the state is recorded.

(1). DUCK LAKE. This is the only body of water of any size in the region. *Dianthera americana* and *Pontederia cordata* were growing on its banks in great abundance.

(2). DRY WOODED HILLSIDES. Characterized by several *Desmodiums, Lycopodium tristachyum* and *Habenaria Hookeri*. We were much surprised to find *Serapias Helleborine* at two stations. The plants were small and scraggly.

(3). SWAMPS, AND ADJACENT SPRINGY PLACES. The only noteworthy plant in the swamps themselves was *Potentilla palustris*, and it was very scarce. But the borders yielded a great deal more. *Samolus floribundus* was common, *Habenaria flava* and *H. lacera* were frequent. *Spiranthes lucida* and *Muhlenbergia racemosa* were occasional. *Juncus canadensis* var. *subcaudatus* and *Gerardia paupercula*, the distribution of which in the State is little understood, were found growing together in one station. *Carex Grayii* was found in just one locality. The rare *Juncus Torreyi* was found in one place only, but was very abundant, growing luxuriantly, and covering almost an acre of ground.

(4). SWAMPY WOODS. The flora in these woods was rather limited. The lowest ground which was under water almost all summer, supported a luxuriant growth of *Calla palustris* and *Saururus cernuus*. On hummocks, just above water, *Mitella nuda* was frequent, while *Liparis Loeselii* and *Habenaria fimbriata* were occasional. *Milium effusum* and the rare *Glyceria melicaria* were occasional in open places.

(5). BOTRYCHIUM WOODS. These peculiar woods must be described separately. Lying a short distance northeast of Spring Lake, they are about a mile long and a quarter mile wide. The soil was deep black muck almost devoid of undergrowth. The trees, of which *Betula lutea* was the most noteworthy, grew so thick that the sun scarcely pene-

trated to the ground at any point. No less than five species of *Botrychium* were found here; the rare *B. simplex*, *B. ramosum*, *B. angustisegmentum*, *B. obliquum* var. *dissectum*, and *B. virginianum*. Except a few Lycopodiums, most of the undergrowth was composed of orchids. *Habenaria bracteata* was the least common; *Corallorrhiza maculata* was the most abundant. *Habenaria flava* was frequent. *Serapias Helleborine* was common, growing luxuriantly with large and highly colored flowers. The best find, however, was the dainty *Pogonia trianthophora*. Two patches were found, about four hundred plants in all, in each case growing under yellow birch. Nearly all the flowers oddly enough, were pure white.

(6). Arbor-vitae swamps. These swamps of which there are two in the region, had considerable sphagnum in them, but the flora was so different from the ordinary bog flora, that it must be treated separately. The most striking feature was the great abundance of *Cypripedium hirsutum*. Many thousands of these plants were in full bloom on July 3rd, 1916, making a sight never to be forgotten. *Eriophorum viridi-carinatum* was abundant. *Habenaria clavellata*, *Pyrola asarifolia var. incarnata*, and the rare *Valeriana uliginosa* were common; *Triglochin palustris* was common in one place only. *Chiogenes hispidula* and *Pogonia ophioglossoides* were frequent. A very little *Scirpus hudsonianus* and *Habenaria hyperborea* were collected. A few plants of the rare *Pogonia trianthophora* were found on hummocks under the arbor-vitae. At this station the flowers were pink.

(7). Sphagnum bogs. Besides the familiar bog heaths, several plants deserve mention. The borders were covered with a dense growth of *Cypripedium acaule* and *Smilacina trifolia*. White flowers of the former were by no means rare. *Habenaria clavellata* was abundant. *Bartonia virginica*, *Carex trisperma*, and *C. paupercula* var. *irrigua* were common. *H. blephariglottis* was frequent. Three plants of *Microstylis unifolia* were detected by Prof. Wright.

Out in the bogs proper the season witnessed an interesting succession of rare plants. In June *Eriophorum callitrix* filled all open places with occasional colonies of *Scheuchzeria palustris*. *Arethusa bulbosa* was found in one place only. Under the shade of the Vacciniums, *Pogonia verticillata* was common, though very few plants produced flowers. The best find, however, was *Listera australis*, which turned out to be common in two of the bogs. We had not even considered it as a possibility. The junior author, in proceeding from one open

place to another, was scrambling under a dense tangle of blueberry bushes, when a cluster of small brownish flowers appeared near his right foot. In this unscientific manner, the first plant was detected. Careful search on hands and knees revealed hundreds of scattered plants, but so inconspicuous is this species that many times the discoverer of some new plants would lose sight of them while waiting for the other members of the party to arrive. Even when he did not, the others would frequently have difficulty in finding them without assistance. It is unquestionably a difficult species to detect. The brownish flowers are just the color of the shadows, and the plant is usually buried in sphagnum up to the leaves. Our specimens varied from about 8 cm. to 3 dm. in height, the average height being about 1 dm. Occasional plants bore a third leaf.

Later in the season, *Pogonia ophioglossoides* and *Calopogon pulchellus* were in full bloom; *Woodwardia virginica* was common; and in August *Eriophorum virginicum* (both varieties) and *Rhynchospora alba* were nodding in all the open places.

(8). Miller's bog. This bog, just north of the Miller farm at Spring Lake, differed from all others in having no open sphagnum and being very much grown up. The flora itself was very distinct. *Potentilla fruticosa, Lonicera oblongifolia, Myrica cerifera* and *M. Gale.* were common shrubs. *Salix candida* was present in small quantities. *Lathyrus palustris* and var. *myrtifolius* were climbing everywhere. *Arenaria lateriflora* was common. *Cladium mariscoides* and the rare *Eleocharis rostellata* were found nowhere else. *Triglochin maritimum,* which is very rare inland in this State, was frequent.

(9). The Westbury prairie. This is a flat plain about one mile long by a quarter wide southwest of the town of Westbury, in Wayne Co. The soil was largely peat with about two inches of water; very little sphagnum was present. The chief growth was composed of sedges of various kinds, mainly *Carex filiformis.* In early July, the whole prairie was pink with *Calopogon* and *Pogonia,* a sight rivalling if not surpassing in beauty the appearance of these plants at the famous Mendon Ponds near Rochester. In August, *Aster junceus* was abundant, *Solidago uniligulata* and *Utricularia intermedia* were fairly common.

(10). Open meadow.— South of Butler along the edge of Crusoe Creek is a peculiar type of open meadow, which it is difficult to characterize. It was not so wet as the Westbury prairie, there was no sphagnum, and but little peat. In area it must have been several

square miles. Being well grown up with grasses and sedges, there was a curious jumble of plants, making it hard to define ecologically. *Parnassia caroliniana* was found here only. *Angelica atropurpurea* was common, and frequently reached a height of twelve feet. *Carex limosa*, *Triglochin palustris*, and *Hierochloë odorata*, the latter very rare in the interior of the State, were frequent. The great feature of this meadow, however, was the extreme abundance of the rare *Valeriana uliginosa*. Over several acres, the pure white corymbs of this plant was the characteristic vegetation. We have no hesitation in saying that there is enough *Valeriana* here to supply all the herbaria of the country. This rare plant in such abundance was indeed an inspiring sight.

The finding of so many rare species in so limited an area led the authors to investigate the status of these forms throughout the State. The bibliographical work necessary was largely undertaken by the senior author, as well as a careful examination of all local herbaria. Many stations are here published for the first time, including several omitted from territory covered by local floras. The writers were surprised to discover how few counties in the State have been explored at all thoroughly. The southwestern, and many of the northern counties still remain practically unknown botanically. The records given below are presented in the hope that they will stimulate interest in the flora of the State, and in the belief that a mere list of the rare plants from one restricted locality is of little general interest. The numerals after each record refer to the publications and herbaria consulted, a list of which is appended at the end of the paper.

BOTRYCHIUM SIMPLEX E. Hitchcock. Herkimer Co.[1]: State Marsh near Jerusalem Hill, Litchfield (2). Lewis Co.: Fenton's Fourth Lake, *Mrs. Barnes* (8), vi. 352. Oneida Co.: pasture near Fall Brook, W. of Fish Creek (2). Otsego Co.: Unadilla Forks, *Brown* (3). Rensselaer Co.: *Dr. Waas* (1). Orange Co.: Highlands on Hudson, *Dr. Barrett* (1). Suffolk Co.: Riverhead, *Miller* (11), 1872, p. 89; Wading River, *Miller* (8), iv. 42. On Long Island, and up Hudson Valley to Dutchess Co. (17). Chenango Co.: Oxford, *Coville* (3). Tompkins Co.: Danby, 1882, *F. C. C. & W. R. Dudley* (9). Onondaga Co.: Otisco, *S. N. Cowles* (11), 1872, p. 108; Syracuse, rare (5). Oswego Co.: near Oswego, *A. Wibbe*, also *C. S. Sheldon* (11), 1879, p. 53. Cayuga Co.: woods N. of Spring Lake, Conquest, June 10, 1916, *F. P. Metcalf, L. Griscom* (10).

BOTRYCHIUM ANGUSTISEGMENTUM (Pease & Moore) Fernald. Essex

[1] The counties are arranged geographically, starting with the most northern and going south to New York and Long Island and then working northwestward.

Co.: Cascadeville, *C. H. Peck* (11), 1886, p. 75. Oneida Co.: Utica, *B. D. Gilbert* (8), xi. 76; sandy mounds in pasture 3 miles N. of Taberg (2). Fulton Co.: near Northampton and Northville, *C. H. Peck* (11), 1879, p. 85. Rensselaer Co.: Petersburgh, *C. H. Peck* (11), 1883, p. 40. Ulster Co.: Pine Hill, *C. H. Peck* (11), 1879, p. 54; Sam's Point, *N. L. Britton* (8), x. 106. Westchester Co.: Lake Mohegan, *Leggett* (11), 1870, p. 101. Rockland Co.: Palisades, *C. F. Austin* (7), 1906, p. 229. Westchester and Rockland Cos.: increasing and becoming common northward (17). Chenango Co.: rather common, *Coville* (8), xii. 53. Cortland Co.: near Truxton, 1893, *K. M. Wiegand* (9). Tioga Co.: Oakley Corners, Oswego, July, 1911, *H. M. Mapes* (10). Tompkins Co.: near Danby, 1883, *W. R. Dudley* (9). Cayuga Co.: woods S. E. of Featherbed Bog, Victory, June 11, 1916, *F. P. Metcalf, L. Griscom, A. A. & A. H. Wright;* woods N. of Spring Lake, Conquest, June 10, 1916, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf* (10). Orleans Co.: Holley, *W. H. Lennon* (4). Chautauqua Co.: Cassadaga Lake (6).

BOTRYCHIUM RAMOSUM (Roth.) Aschers. Essex Co.: Ray Brook (11), 1890, p. 84; near Cascade Lake (11), 1899, p. 156. Lewis Co.: *Mrs. Barnes, W. W. Hill* (11), 1878, p. 65. Oneida Co.: Deerfield, *E. Hunt* (11), 1875, p. 90; ravine near Utica, *J. A. Paine, E. Hunt* (8), iii. 33; Utica, *B. D. Gilbert* (8), xi. 76. Rensselaer Co.: Petersburgh (11), 1883, p. 40. Reported but not definitely known, Long Island, otherwise known only from northern Westchester Co., northward (17). Chenango Co.: common, *Coville* (8) xii. 53. Cortland Co.: Truxton (3 stations) 1892, *K. M. Wiegand* (21). Tioga Co.: Oakland Corners, Owego, July, 1911, *H. M. Mapes* (10); near North Spencer, June, 1915, *E. Dean* (10). Tompkins Co.; McLean, *Dudley* (11), 1883, p. 40; Malloryville, 1881, *W. R. Dudley* (9). Cayuga Co.: woods E. of Mud Pond, Conquest, June 6 and 7, 1916, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf* (10); woods N. E. of Featherbed Bog, Victory, June 11, 1916, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf* (10). Wayne Co.: reported in (4); woods near Turtle Pond, Savannah, June 12, 1916, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf* (10). Monroe Co.: Henrietta, *F. B. Fuller;* Webster, *M. S. Baxter* (4). Orleans Co.: Holley, *W. H. Lennon* (4).

LYCOPODIUM TRISTACHYUM Pursh. Herkimer Co.: Grant, Ohio, Trenton and Grand View, *Haberer* (11), 1913, p. 37. Oneida Co.: Remsen, Hinckley, and Forestport, *Haberer* (11), 1913, p. 37; sandy oakwoods, near head of Oneida Lake, *Haberer & House* (11), 1913, p. 37. Throughout the range (17). Chemung Co.: wooded pastures, N. E. corner Van Etten, June 3, 1915, *A. J. Eames & L. H. MacDaniels* (10). Cortland Co.: Truxton, 1906, *K. M. Wiegand* (21). Cayuga Co.: woods on E. bank of Duck Lake, Conquest, June 10, 1916, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf*, and July 1, 1916, *A. J. Eames* (10).

SCHEUCHZERIA PALUSTRIS L. Franklin Co.: bog W. of Ampersand

Lake, 1899, *W. W. Rowlee, K. M. Wiegand, G. T. Hastings* (9). Herkimer Co.: Frankfort Hill (2). Oneida Co.: Summit Lake, Mud Lake, Hidden Lake, Swamps of Rome, Marshes of Point of Rock Lake, North Pond and North Woods, Wetmore's Pond, Bog near Oriskany (2). Rensselaer Co.: Cranberry Marsh, Sand Lake, *C. H. Peck* (11b), 1910, p. 72. Greene Co.: Tannersville (17). Dutchess Co.: Bingham Mt. (17). Broome Co.: Pond Brook, N. of Binghamton, *Clute* (3). Chenango Co.: MacDonough and Preston, *Coville* (3); Brisbin Swamp, 1887, *H. L. Stewart* (9). Onondaga Co.: Cicero Swamp, August 21, 1916, *K. M. Wiegand* (10). Oswego Co.: Granny's Orchard near Palermo, Bog at Williamstown, Bog near Long Bridge Pond, Paddy Lake near Scriba, 1891–95, *W. W. Rowlee* (9). Cayuga Co.: Featherbed Bog, Victory, June 11, 1916, *F. P. Metcalf, L. Griscom;* bogs north, N. E. and E. of Duck Lake, July 1, 1916, *F. P. Metcalf, L. H. MacDaniels* (10). Seneca Co.: Junius, *Sartwell* (12), also 1916 (10). Monroe Co.: Sphagnum Bogs, Mendon (4). Chautauqua Co.: Hanover (6).

TRIGLOCHIN MARITIMA L. Common along the coast of Long Island, New York City and Staten Island (17). Onondaga Co.: Salt Marshes, Salina, Onondaga Lake, *Cooper* (1), (5) and 1916, *K. M. Wiegand* (10). Oswego Co.: Mud Lake, Hannibal, 1894, *W. W. Rowlee* (9) and *H. D. House* (11), 1914, p. 48. Cayuga Co.: Miller's Bog near Spring Lake, Conquest, June 9, 1916, *L. Griscom, A. A. & A. H. Wright, F. P. Metcalf,* and June 30, 1916, *K. M. Wiegand, A. J. Eames* (10). Wayne Co.: reported in (4); abundant in arbor vitae-larch swamp and prairie, S. W. of Westbury, Butler, July 2, 1916, *K. M. Wiegand, A. H. Wright, F. P. Metcalf,* and August 12, 1916, *A. H. Wright, F. P. Metcalf, L. Griscom* (10).

TRIGLOCHIN PALUSTRIS L. Oneida Co.: Castle Swamp, *H. D. House* (11), 1913, p. 32. Madison Co.: Peeksport and Peterboro (11), 1913, p. 32. Shores of Long Island, (8), iii. p. 53. Onondaga Co.: marshes around Onondaga Lake, Salina and Liverpool, *Pursh* (1), and 1898, *G. T. Hastings* (9); marshy ground near Manlius Center, *C. H. Peck*, 1885, (5), also (11), 1880, p. 35; Green Lake, near Kirkville (11), 1913, p. 32. Seneca Co.: Junius, *Sartwell* (1), also 1883 (9), and 1916 (10). Wayne Co.: springy place N. of Crusoe Lake, Savannah, July 3, 1916, *A. J. Eames, F. P. Metcalf,* and along border of Crusoe Prairie, Savannah, October 5, 1916, *F. P. Metcalf, A. H. Wright* (10). Genesee Co.: West Bergen Swamp (2). Niagara Co.: Niagara; *Cooper* (1); Strawberry Island, Niagara River, *Clinton* (6). Erie Co.: near Buffalo, *Kinnicult* (1).

HIEROCLOË ODORATA (L.) Wahlenb. Kings Co.: vicinity of Erasmus Hall, *J. B. Zabriskie* (22a), 1835. On Long Island, Staten Island, and in the Bronx and Westchester Co., certainly known northward (17). Wayne Co.: *E. L. Hankenson* (4); Crusoe Prairie, N. of Crusoe Lake, Savannah, June 12, 1916, *F. P. Metcalf, L. Griscom, A. A. & A. H. Wright* (10). Monroe Co.: Sullivan's, *M. S. Baxter* (4b).

Glyceria melicaria (Michx.) Hubb. (*G. Torreyana* (Spreng.) Hitch.) Franklin Co.: Rustic Lodge, Saranac Lake, 1899, *W. W. Rowlee, K. M. Wiegand, G. T. Hastings* (9). Essex Co.: woods, swamps, Raybrook, North Elba (11a), 1899, p. 150. Oneida Co.: Valley of Mohawk, frequent (2); southern part of Co., common, *Gray* (2). Rensselaer Co.: Cranberry Marsh, Sand Lake, *C. H. Peck* (11b), 1910, p. 71. New York Co.: Tibbets' Brook, City Limits (8), vii. 114. Local in the Bronx, and on Long Island, increasing northward (17). Chenango Co.: McDonough 1884, *F. V. Coville* (21), Tioga Co.: swamp near Smithboro (3a). Cortland Co.: Thompson swamp, Truxton, 1896, *K. M. Wiegand* (9); Solon (1873) and Cuyler (1893), *K. M. Wiegand* (21). Cayuga Co.: West of Locke Pond, (?), *F. C. Curtice* (12); S. E. of Duck Lake, Conquest, June 11, and July 1, 1916, *F. P. Metcalf, L. Griscom* (10). Oswego Co.: S. W. of Williamstown, 1894, *W. W. Rowlee* (9); Fulton, 1889, *W. W. Rowlee* (9). Wayne Co.: S. of Turtle Pond, Savannah, June 12, 1916, *F. P. Metcalf, L. Griscom* (10). Monroe Co.: rare, *L. Holzer* (4). Erie Co.: reported in (6). Reported from the western part of the State, (2).

Eleocharis rostellata Torr. Westchester Co.: reported in (17). Queens Co.: Flushing and Springfield, *T. F. Allen* (11), 1866, p. 205. Long Island, not uncommon (17). Onondaga Co.: common (5). Cayuga Co.: Miller's Bog near Spring Lake, Conquest, June 10, 1916, *F. P. Metcalf, L. Griscom, A. A. & A. H. Wright* (10). Seneca Co.: West side Cayuga Marshes, about Indian Salt Springs, Seneca Falls (12); Junius, about Lowery's and Newton's Ponds (12). Yates Co.: Penn Yan, *Sartwell* (1). Monroe Co.: Sullivan's *M. S. Baxter* (4b). Genesee Co.: common in swamp W. Bergen (15).

Scirpus hudsonianus (Michx.) Fernald. Lewis Co.: *F. B. Hough* (22b), 1846; Cliffs of Black River, Leyden, 1912, *J. V. Haberer* (11), 1913, p. 38. Oneida Co.: Boonville, 1912, *J. V. Haberer* (11), 1913, p. 38; Oriskany Swamp, *Knieskern, Gray, Vasey* (2). Herkimer Co.: Hidden Lake, Litchfield; Mud Lake, *C. H. Peck* (2). Hamilton Co.: Elm Lake, *C. H. Peck* (11), 1913, p. 38. Warren Co.: Aiden Lair, *C. H. Peck* (11), 1913, p. 38. Madison Co.: Rippleton Swamp, 1894, *K. M. Wiegand* (21). Tompkins Co.: Round Marshes, 1879, *W. R. Dudley* (9), and 1916, *E. Dean, P. Munz.* Onondaga Co.: frequent (5). Oswego Co.: sphagnum swales beyond Rome, on both sides of county road (2); Mud Lake, Hannibal, 1895, *W. W. Rowlee* (9), and *H. D. House* (11), 1914, p. 48. Wayne Co.: *E. L. Hankenson* (4); Arbor Vitae swamp N. E. corner of Butler, July 3, 1916, *F. P. Metcalf, A. H. Wright* (10).

Carex Grayii Carey. Oneida Co.: meadows at Utica, 1834, *Dr. Gray* (2); above Utica, near Whitesboro (2); Oriskany, *Knieskern, Vasey* (2); Wood Creek, *T. Carey* (2). Greene Co.: New Baltimore, *Howe,* (11), 1869, p. 135. Westchester Co.: Hastings on Hudson, 1895, *Carrie Harrison* (9). Eastern New York, locally, *Fernald* (7),

iv. p. 229. Richmond Co.: reported in (17). New York Co.: reported in (17). Tioga Co.: Barton, *Fenno* (19). Cortland Co.: Truxton, 1894, *K. M. Wiegand* (21). Tompkins Co.: Renwick Park, Ithaca, 1896, *E. Carss* (9); Renwick Woods, Ithaca, July 21, 1916, *F. P. Metcalf* (10); Freeville, S. of Fir Tree swamp, 1882, *F. C. C. & W. R. Dudley* (12). Onondaga Co.: frequent (5); Minias, *Vasey* (9). Cayuga Co.: head of Owasco Lake, Moravia, 1879, *C. Atwood* (9). Wayne Co.: reported in (4), boggy ditch along roadside, W. of Howland's Island, Savannah, July 3, 1916, *K. M. Wiegand, F. P. Metcalf* (10). Monroe Co.: Valley of Genessee River (2); near Rochester, *C. Dewey, C. M. Booth, L. Holzer* (4). Wet places in central and western part of the State, rare in eastern part, *Peck & House* (13).

(*To be continued.*)

A GLANDULAR FORM OF HIERACIUM PANICULATUM L.— The writer has collected in Berkshire County, Massachusetts, several specimens of *Hieracium paniculatum* L. which have the branches of the inflorescence and even the upper part of the stem covered with stipitate glands. Britton and Brown in their Illustrated Flora, page 330 describe this species as "quite glabrous or somewhat glandular." An examination of the material in the New England Botanical Club collection and the Gray Herbarium shows that the glandular form is found more commonly on the Alleghany upland than off it. As the glandular form seems thus to have a certain geographic significance the writer suggests setting it off under the following name:

HIERACIUM PANICULATUM L., forma **glandulosum**, nov. form., pedicellis et caule superiore glandulis vestitis. Specimens of this form have been collected in the following localities: Camden, Maine (*M. L. Fernald*); Breezy Point, New Hampshire (*E. F. Williams*); Townshend, Vermont (*L. A. Wheeler*); Sandisfield, Stockbridge, and Great Barrington, Massachusetts (*R. Hoffmann*); Providence, Rhode Island (*J. F. Collins*); Black Mountain, Kentucky (*T. H. Kearney, Jr.*).

In specimens of this form the hairs characteristic of the base of the stem are found clothing the greater part of the main stem. In nearly all specimens of the typical smooth form the involucral scales at least show a glandular tendency, but in extreme forms even the involucre is perfectly glabrous.— RALPH HOFFMANN, Kansas City, Missouri.

Utricularia fibrosa in Massachusetts.—On 30 September, 1916, I discovered on the shore of a small pond in the southwestern part of Plymouth, growing among the rather dense culms of *Cladium* in shallow muddy water, a colony of a species of *Utricularia* which subsequent herbarium study has shown to be *U. fibrosa* Walt., a plant not before reported from north of Long Island. The broad upper lip is erect in flower, strongly nerved and fluted in the middle of the back. The lower lip is strongly descending, slightly three-lobed, and the slenderly conical spur is practically as long as the lower lip and subappressed to it. The prominent 2-lobed palate is slightly veined with brown, as is the spur; otherwise the flowers are of a clear yellow. The two sketches herewith presented, made from the fresh specimens in the field, will serve to give some idea of the appearance of this interesting addition to our flora.—S. F. Blake, Stoughton, Massachusetts.

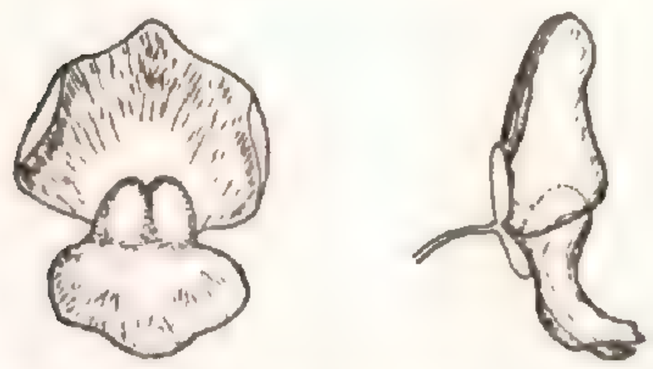


Fig. 1.— *Utricularia fibrosa*, front and side views, about life size.

Some Traits of Epipactis in Vermont.—The writer finds some distinguishing characteristics in Epipactis which seem to be worthy of further study. When examined in living specimens, the sepals, both lateral and dorsal, of *E. pubescens*, as it comes into flower, are definitely tinged in the center with a green color. The sepals of *E. tesselata*, on the other hand, have an equally well defined tinge of rose color, while in *E. repens* var. *ophioides* they are pure white. If these color-differences observed in Vermont should prove constant when the plants in question are studied in other parts of their ranges, they will yield an easy means of distinguishing the species of this attractive but somewhat technical little group.

It is interesting to note that while *E. repens* loves the cedar swamp, it is also found in rich woods, but when in the woods, its leaf becomes a dark green, losing its well defined markings to such an extent that they are sometimes barely discernible.—H. W. Child, Boston, Massachusetts.

A New Luzula from eastern Canada.—Luzula campestris (L.) DC., var. **acadiensis**, n. var., caespitosa; culmis 1–4 dm. altis;

capitulis castaneis breviter ovoideis vel crasse cylindricis 4–8 mm. longis 4–6 mm. crassis, 2 vel 3 subsessilibus, reliquiis pedunculatis, pedunculis ad 2(–2.5) cm. longis; perianthiis 3–4 mm. longis capsulam valde superantibus.

Caespitose: culms 1–4 dm. high: heads castaneous, short-ovoid or thick-cylindric, 4–8 mm. long, 4–6 mm. thick, two or three of them subsessile, the others on ascending peduncles up to 2(–2.5) cm. long: perianth 3–4 mm. long, distinctly exceeding the capsule.— Prince Edward Island, New Brunswick and Nova Scotia. PRINCE EDWARD ISLAND: dry border of woods, Charlottetown, June 30, 1914, *Fernald & St. John* in *Plantae Exsiccatae Grayanae*; recent clearing, west side of St. Peter's Bay, June 29, 1914, *Fernald & St. John*, no. 10,990 (TYPE in Gray Herb.); sandy thicket, Morell, June 29, 1914, *Fernald & St. John*, no. 10,991. NEW BRUNSWICK: Bay Verte, June 5, 1896, *E. M. Goodwin*. NOVA SCOTIA: fresh or brackish swale, Grand Narrows, Cape Breton County, July 20, 1914, *Fernald & St. John*, no. 10,994.

Resembling var. *multiflora* (Ehrh.) Čelak, but that widely distributed plant has the capsules exceeding the shorter perianth (2.5–3.3 mm. long). In its long perianth and short capsule var. *acadiensis* is more closely related to the southern var. *echinata* (Small) Fernald & Wiegand[1] which occurs from Texas to Georgia and northward to eastern Massachusetts. The southern var. *echinata*, however, has much looser inflorescences, rarely with more than one of the heads sessile, the others on more spreading (often widely divergent) longer rays (up to 5.5 cm. long).— M. L. FERNALD, Gray Herbarium.

SALVIA SYLVESTRIS L. IN COUNTY PEEL, ONTARIO.— During the past summer Mr. A. Laidlaw, who is something of a botanist, noticed an unusual plant whilst cutting his alfalfa for hay. There was only one individual of it and it was growing on sandy loam in a high dry field. He gathered and pressed the specimen and when he showed it to me some time afterwards I was completely puzzled over it. I tried all the accessible floras but failed to place it. The specimen had four stems from a single root and I sent one of them to the Gray Herbarium, where it was referred to Mr. Harold St. John for identification. He informs me that it is *Salvia sylvestris* L., a native of eastern Europe and western Asia. Previous to the present finding, Mr. St. John tells me that

[1] RHODORA, XV. 42 (1913).

so far as he can learn it has been noticed but once in America, namely in Montgomery County, Pennsylvania. He also says that it is not mentioned from America in any publication so far as he has ascertained. As alfalfa seed is frequently imported into Canada from Europe, we can safely infer that this interesting plant has been casually introduced by impure seed.— JAMES WHITE, Snelgrove, Ontario, Canada.

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ABNORMAL FLOWER STRUCTURE IN OXALIS STRICTA L.

H. F. Bergman.

(Plate 122.)

While collecting flowers for class use one day in the autumn of 1915 the attention of the writer was attracted by the peculiar appearance of one or two plants of *Oxalis stricta* L. Curiosity as to the nature of this peculiarity led to a closer examination, which revealed the fact that it was due to the replacement of normal flowers by various abnormal developments and in part to the reduction in size of the leaves, which were also decidedly paler than ordinary leaves.

Henri Hus (1907) has described a variant form of *Oxalis stricta* having green petals and somewhat smaller fruits. This form he named *Oxalis stricta viridiflora*. The petals of this form, in addition to the difference in color, differ in shape, width, distribution of the vascular bundles, as also in the shape of the epidermal cells, in the absence of ridges in the latter, number of stomata, and in the number and kinds of hairs present. Bartlett (1909) also reports the occurrence of *Oxalis stricta viridiflora* which, as in specimens described by Hus, differ from normal flowers of *Oxalis stricta* only in the petal characters.

None of the specimens found by the writer possessed the green petals described by Hus (1907) and Bartlett (1909). The sepals and pistils also were distinctly different from those described by either Hus or Bartlett.

Various degrees of abnormality were found, ranging from an almost normal condition to such wide departures from it that they bore little resemblance to flowers. The sepals of normal flowers are narrow and

linear to oblong in form, measuring about 4 × 1 mm. (fig. 1). Those of the abnormal flowers were broadly obovate and obcordate at the apex, measuring 3.2 × 3.0 mm. (fig. 2). In shape and vein-arrangement they closely resemble a leaflet of a foliage leaf (fig. 3). Sepals of this form occurred in all the abnormal flowers regardless of other peculiarities that were exhibited.

The sepals of abnormal flowers are pubescent on the back with appressed hairs as in normal flowers, the hairs being mostly of the unicellular, thick-walled type, as described by Hus ('07:102). They differ from foliage leaves in the amount of pubescence, that on the leaves being rather sparse and confined to the under side. The cells of the sepals of abnormal flowers are less elongated than in normal flowers but never as nearly isodiametric as those of the leaves so that the sepals of the abnormal flowers, while strongly suggesting foliage leaves in outline and arrangement of veins, still retain a closer resemblance to normal sepals in the amount and kind of pubescence and in cell-characters.

The petals were not uniform in shape in all the abnormal specimens. Instead of being obovate to obcuneate and yellow as in normal specimens (fig. 4), most of them were reduced to narrow, linear or oblong, pale yellow or whitish structures. One of the most extreme forms is shown in figure 6. This specimen had petals which were nearly orbicular, about 3 mm., in diameter and with a slender claw of about the same length. Others varied between the linear petals (fig. 5) and the normal shape (fig. 4).

The vein-arrangement and shape of cells in petals of the abnormal specimens were similar to those of normal ones except that the epidermal cells at the tips of the petals did not have the ridges projecting into the cell as is true of the epidermal cells at the tips of normal petals.

The stamens as in normal flowers, were of two lengths, the inner series being the longer. They differed from stamens of normal flowers however, in that in all cases they were separate instead of monadelphous. In some specimens the stamens were apparently normal except for being separate. In others the anthers of the inner series were either poorly developed or entirely wanting. The anthers of the outer series were apparently normal. In one specimen part of the stamens had been transformed into narrow, petaloid structures. No examination of the pollen from any of the specimens was made.

The pistil showed the most varied and peculiar structures. In

normal flowers the pistil is columnar, sharply 5-angled and measuring usually 16–18 mm. in length. In most of the variant forms examined the pistil was much smaller than in normal flowers and in many specimens more or less twisted and distorted. The smaller pistils were obpyriform in shape, with the lobes or divisions usually strongly rounded on the back and only in a very few specimens sharply angled as in normal flowers. Development of seeds in any abnormal specimens was not observed.

Most of the specimens found were of the kind shown in figures 7, 8 and 9. These flowers were the nearest approach to the usual type. The sepals were broadly ovate and leaf-like. The petals differed only in being narrower, shorter and very pale in color. The stamens differed from normal ones in being separate. The anthers of the outer series were apparently normal while those of the inner series were poorly developed or entirely lacking. The smallest flower measured only 3 mm. in diameter with a pistil less than 1 mm. in height. Most of the smaller flowers (fig. 9) measured 5–6 mm. in diameter with pistils 1.5–2 mm. in height. The larger forms measured 7–8 mm. in diameter with pistil about 4 mm. high. A few specimens had sharply angled pistils (fig. 7), thus resembling most nearly the form of the pistil in normal flowers. The pistil of the specimen shown in figure 9 was obpyriform and sharply angled, in these respects being intermediate between the specimens shown in figures 7 and 8, but smaller than either of them.

Two flowers (figs. 10 and 11) had enlarged, obpyriform or balloon-shaped pistils, the carpels being partly separate at the apex so that the interior of the ovary could be observed. No ovules were present in these specimens. The sepals and stamens of these flowers were as above described. The petals were rather longer than in most specimens and narrowly obcuneate.

A more extreme variation in the pistil form was observed in several flowers (figs. 12, 13 and 15). In these the carpels appeared as separate parts, outspread so as to resemble the petals of a flower. This condition might be produced from a form such as is shown in figures 10 and 11 by having the carpellary leaves become separated to the base and changed from a vertical to a horizontal position. Inside the carpellary leaves are small leaf-like structures which apparently replace the ovules of a normal ovary.

The specimens shown in figures 14 and 16 were the most interesting

of the series. The sepals were broadly obcordate as described in the other forms. The petals were narrowly oblong. Some of the stamens had been transformed into narrowly linear petaloid structures while others were anther-bearing and apparently normal. The pistil did not appear as in other forms described but in its place was found a prolification of the floral axis producing at the base five oboval, emarginate leaves with very short petioles and culminating at the apex in three leaves of three leaflets each. The leaflets are shown still folded together in the illustration. The condition most closely approaching this was found in the specimens shown in figures 12, 13, and 15, where the carpels have been transformed into leaves, retaining more or less of a cup shape, but without any evident elongation of the floral axis such as had occurred in the specimens last described.

Masters (1869) and Penzig (1890) cite instances of phyllomorphy of floral parts and median prolification in many kinds of flowers. Phyllody of the carpels and ovules is known to occur in many plants. Masters ('69: 259) refers to the occurrence of petalody of the stamens in *Oxalis* but apparently no case of the peculiar modifications of the flowers of *Oxalis stricta* as described in this article has ever before been reported. No explanation is offered for the abnormalities described.

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Explanation of Plate 122.

Fig. 1. A sepal of a normal flower, × 33. Fig. 2. A sepal of an abnormal flower, × 33. Fig. 3. One leaflet of a foliage leaf, × 7. Fig. 4. A petal of a normal flower, × 33. Fig. 5. A petal of an abnormal flower of the type shown in fig. 15, × 36. Fig. 6. The usual form of the petals of abnormal flowers, × 33. Figs. 7 and 8. Abnormal forms of most frequent occurrence, × 33. Fig. 9. A small abnormal flower without stamens or petals, × 33. Figs. 10 and 11. Abnormal flowers with inflated and partly opened pistils, × 33. Figs. 12, 13, and 15. Forms with the carpellary leaves separate and outspread, the ovules replaced by small leaf-like structures, × 33. Figs. 14 and 16. Forms showing phyllomorphy of the carpels and median prolification, × 33.

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THE SPECIFIC CHARACTERS OF HEPATICA AMERICANA.

M. L. Fernald.

It has long been known that the common American plant which has passed as *Hepatica triloba* Gilib. (1781) or more properly as *H. nobilis* Schreb. (1771) differs in some respects from the typical European plant, and in 1814 Pursh treated it as *H. triloba* **a** *obtusa* with the lobes of the leaves rounded and flowers "generally smaller than in the European plant."[1] In 1817 De Candolle separated it as *H. triloba* β. *americana*[2] on account of its much more pilose petioles and scapes, smaller flowers, and the more rounded lobes of the leaves. Somewhat later Ker took it up as *H. americana*, saying "We have no hesitation in recording the american plant as a distinct species from the european *triloba*, to which it has been generally appended for a variety. The lobes of the leaves are rounder and less pointed in the american plant, the flower-stem and leaf-stalks shaggily furred, the whole altogether smaller and of different appearance."[3] Subsequent authors for the most part have not recognized the distinctness of the American and European plants, although the essentially continental distribution of the European species and the essentially Alleghanian range of the American indicate that the identity of the two should at least be questioned; since very few, if any, plants are strictly identical in these two very dissimilar areas. Examination of abundant fruiting material of the American plant shows it to possess an achene quite unlike that of the European species. In *H. nobilis* of Europe the plump, conic-ovoid achene tapers to a short thick beak which is terminated by the sessile stigma. In the American plant, on the other hand, the much more slender fusiform or lance-subulate achene is terminated by a very slender and definite, often curved, style. Possessing this definite fruit-character along with its usually much smaller flowers and its rounder-lobed leaves, the Alleghanian plant seems to be an endemic American species which should be called *Hepatica americana* (DC.) Ker.

Whether the plant of eastern Asia is identical with the eastern American or the European species the writer is unable to determine since he has had access to no Asiatic material.

[1] Pursh. Fl. Am. Sept. ii. 391 (1814).
[2] DC. Syst. i. 216 (1817).
[3] Ker in Edwards, Bot. Reg. v. t. 387 (1819).

Hepatica nobilis in its foliage-character stands somewhat intermediate between the two American species, *H. americana* and *H. acutiloba* DC., and in its achenes more strongly suggests the latter species. The leaves of *H. nobilis*, however, are much more obtusely lobed and have less pronounced sinuses between the lobes. Its involucral bracts are more obtuse and its sepals ordinarily broader, so that *H. acutiloba* may appropriately be still maintained as an American species.

Typical *Hepatica americana* has the flowers blue-lavender, but two other conspicuous color-forms are found, one with white sepals and the other with rose-pink. These for convenience may be designated

Hepatica americana, forma **candida**, sepalis albis — Frequent throughout the range. Type: rocky woods, Townshend, Vermont, April 16, 1912, *L. A. Wheeler*, in herb. New England Botanical Club.

Hepatica americana, forma **rhodantha**, sepalis roseis — Type collected by *Mrs. Florence van Fleet Lyman*, communicated by C. G. Whiting from plants transferred to his garden at Springfield, Massachusetts (specimen in Gray Herb.).

Gray Herbarium.

POLYMNIA UVEDALIA AND ITS VARIETIES.

S. F. Blake.

While studying recently the variations in pubescence of a Mexican *Polymnia*, I had occasion to examine the abundant material in the Gray Herbarium of the common *P. Uvedalia* to determine whether similar differences were to be found in that species which might throw light on the classificatory value of the variations already noted in the Mexican plant. Somewhat to my surprise, the specimens of *Polymnia Uvedalia* fell readily into three rather distinct varieties of decided geographic trend. The common eastern plant, growing (so far as the material at hand indicates) from New York southward to Georgia, thence north and west to southern Illinois, is always very strongly glandular on the pedicels and branches of the inflorescence with both sessile and stalked glands, and the hispid-pilose hairs common to the other two forms are rare or wanting. A variation represented by

four collections from Florida has much fewer and less conspicuous glands, and intermixed with them a considerable number of hispid-pilose hairs. Plants collected by T. F. Allen, G. H. Shull, and A. B. Seymour at various localities within the range of the typical plant somewhat approach the Floridan form in the presence of hispid-pilose hairs, but are best referred to the typical form on account of the very numerous glands.

West of the Mississippi, from Louisiana to Oklahoma and Texas, occurs a very marked extreme in which the pedicels and to a less degree the branches of the inflorescence are so densely and canescently hispid-pilose that the glands are practically concealed from view. It is interesting to note that one of the specimens of this form, collected by Lindheimer (no. 381), bears this note on the label in Engelmann's hand: "Lindheimer thinks it different from *P. Uvedalia.*"

On the Bermuda Islands, where it is certainly introduced and seems to be rapidly naturalizing itself, this form is the only representative of the species. The plant is not noticed in Reade's list of Bermuda plants (1883), and as it is very unlikely that so conspicuous a plant could have escaped his notice, it seems very probable that it is a recent introduction.

The three variations of *Polymnia Uvedalia* may be named and characterized as follows.

* Pedicels and branches of inflorescence densely glandular; hispid-pilose hairs few or none.

POLYMNIA UVEDALIA L. var. **genuina.** Pedicelli et rami inflorescentiae dense glandulosi, glandulis et sessilibus et stipitatis, pilis hispido-pilosis paucis vel nullis.— *Polymnia Uvedalia* L. Sp. II. ed. ii. 1303 (1763). *Osteospermum Uvedalia* L. Sp. I. ed. ii. 923 (1753). *Polymniastrum Uvedalia* (L.) Small in Small & Carter, Fl. Lanc. Co. 302 (1913).— NEW YORK: western part (*Gray* ?). NEW JERSEY: Weehawken, 1864, *T. F. Allen.* PENNSYLVANIA: Easton, 1869, *T. C. Porter.* DELAWARE: Wilmington, 1842, *E. Tatnell.* VIRGINIA: Smith Co., 1892, *J. K. Small;* Four Mile Run, 1902, *G. H. Shull* 225. NORTH CAROLINA: Caldwell Co., 1891, *Small & Heller;* Biltmore, 1897, *Biltmore Herbarium* 788a. SOUTH CAROLINA: Caesar's Head, 1881, *John Donnell Smith.* GEORGIA: Early Co., 1901, *R. M. Harper* 1225. TENNESSEE: Knoxville, 1894, *A. Ruth* 52; Chilhowee Mts., *A. H. Curtiss* 1380. KENTUCKY: Harlan Co., 1893, *T. H. Kearney, Jr.* 251. INDIANA: Orange Co., 1915, *C. C. Deam* 17347. ILLINOIS: Anna, 1880, *A. B. Seymour.*

* * Pedicels and branches of inflorescence with numerous hispid-pilose hairs more or less concealing the mostly sessile glands.

Var. **floridana**. Pedicelli et rami inflorescentiae sparse glandulosi, glandulis saepissime sessilibus, pilis hispido-pilosis subnumerosis.— Florida: thicket, Brevard Co., Indian River region, 2 Dec. 1902, *A. Fredholm* 5626 (type in Gray Herbarium); Tallahassee, Leon Co., 1895, *G. V. Nash* 2327; Apalachicola, 1897, *Biltmore Herbarium* 788c; without definite locality, *Chapman*.

Var. **densipilis**. Pedicelli et rami inflorescentiae dense canescenterque hispido-pilosi pilis patentibus vel adscendentibus, glandulis inconspicuis.— Louisiana: *Hale*. Oklahoma: Grand River, Cherokee Nation (Ind. Terr.), 1895, *J. W. Blankinship*. Texas: ten feet high, rare on the shady banks of the Guadaloupe near New Braunfels, Aug. 1850, *Lindheimer* 381 (type in Gray Herbarium), also 954; Upper Guadaloupe River, Aug. 1847, *Lindheimer*. Bermuda: shaded bank near Tuckers Town, 1905, *Brown & Britton* 321, also 1908, *S. Brown* 470; near Bailey's Bay, 1908, *S. Brown* 494; along roads, Botanic Garden, Paget, 1905, *J. W. Harshberger;* low shaded place, Paget, 1912, *B. L. Robinson* 50.

Stoughton, Massachusetts.

NOTES ON RARE NEW YORK STATE PLANTS.

F. P. Metcalf and L. Griscom.

(*Continued from page 37.*)

Juncus canadensis J. Gay., var. subcaudatus Engelm. Saratoga Co.: ditches along R. R., South Corinth, *C. H. Peck* (11), 1879, p. 54. "Not reported from New York State" (18). Oswego Co.: Granny's Orchard, Palermo, 1895, *W. W. Rowlee* (9). Cayuga Co.: swale in woods N. E. end of Duck Lake, Conquest, July 12, 1916, *F. P. Metcalf, L. Griscom* (10). Erie Co.: reported in (6).

Juncus Torreyi Coville. Oneida Co.: Oneida Lake (11), 1913, p. 25. Fulton Co.: Johnstown, *Olsson & Alexander* (11), 1913, p 25. Nassau Co.: Long Beach (17). Onondaga Co.: frequent (5). Oswego Co.: collection of *C. S. Sheldon* (11), 1914, p. 25. Cayuga Co.: $1\frac{3}{4}$ miles N. W. of Spring Lake, along roadside, Conquest, August 13, 1916, *F. P. Metcalf, L. Griscom, A. H. Wright* (10). Seneca Co.: Dumont's Road, Seneca Falls, August 1895, *W. W. Rowlee, K. M. Wiegand* (9). Western New York (18). Monroe Co.: Charlotte, *L. Holzer* (11), 1897, p. 281; Long Pond, *Dr. Anna H. Searing* (4); sandy shores of Lake Ontario, *Gray* (2). Niagara Co.: Goat Island, near the River (20). Erie Co.: reported in (6).

SMILACINA TRIFOLIA (L.) Desf. Franklin Co.: Axton, 1901, *W. B. Howard* (9). Pickerel Pond, 1899, *W. W. Rowlee, K. M. Wiegand, G. T. Hastings* (9). Herkimer Co.: Frankfort Hill, North Woods Marshes (2). Oneida Co.: Paris Hill, near Oriskany, Summit Lake, Mud Lake, Jordanville Marshes, South Trenton, Swamp of Rome, Point of Rock Lake (2). Madison Co.: Peterboro, Peeksport, Arbor Vitae swamps, *H. D. House* (11), 1914, p. 42. Dutchess Co.: Pine Plains (17). Orange Co.: *Austin* (8), iv. 17. Chenango Co.: Oxford, *Coville* (3); Brisbin swamp, 1887, *H. L. Stewart* (9). Tompkins Co.: Spruce Swamp, Enfield, 1875, 1884, (9). Onondaga Co.: abundant (5). Oswego Co.: Granny's Orchard, Palermo, Birdall's Bog, Volney, 1894–1895, *W. W. Rowlee* (9). Cayuga Co.: Miller's Bog, bog N. of Miller's Bog, bogs N., N. E., and E. of Duck Lake, Conquest; Feathered Bog and adjoining bogs, Victory, June, July, *A. A. & A. H. Wright, F. P. Metcalf, L. Griscom.* Wayne Co.: Arbor Vitae swamps and bogs, N. E. corner of Butler, also N. and N. E. of Savannah, June, July, *F. P. Metcalf, L. Griscom, A. A. & A. H. Wright* (10). Monroe Co.: Adam's Basin (2). Genesee Co.: Bergen Swamp, 1897, *A. H. Wright* (9). Cattaraugus Co.: Machias (6).

HABENARIA BRACTEATA (Willd.) R. Br. Essex Co.: along Keene Road near N. Elba, *C. H. Peck* (11a), 1899, p. 131. Lewis Co.: *F. B. Hough* (22b) 1846. Herkimer Co.: Fairfield, *Gray*, and Frankfort Hill (2); near Newport, 1901, *H. D. House* (8), xxxii. 376. Oneida Co.: Sangerfield (2). Madison Co.: Brookfield, Gray (2); Cazenovia, *M. C. Conner* (8), xxxii. 376. Schenectady Co.: along Rolleboom of Rotterdam Hills (2). Dutchess Co.: *A. Winchell* (22c), 1851. Reported, but not definitely known from Long Island; rare in Westchester Co., increasing northwestward (17). Chemung Co.: near Elmira, 1893, *Lucy* (3). Cortland Co.: Truxton and Preble, 1893, *K. M. Wiegand* (21). Onondaga Co.: Otisco, 1896 (5); Baldwinsville, *Beauchamp* (8), xxxii. 376. Cayuga Co.: woods N. of Spring Lake, Conquest, June, August, *A. A. & A. H. Wright, F. P. Metcalf, L. Griscom* (10). Yates Co.: *Sartwell,* Herb. Hamilton College (2). Monroe Co.: Brighton, *C. M. Booth;* near Coldwater, *G. T. Fish;* Troutburg, *M. S. Baxter;* Big Woods, Forest Lawn, *Mrs. H. G. Pierce;* Pinnacle Hill, *Mrs. V. Dewing* (4). Genesee Co.: Bergen Swamp (4). Erie Co.: reported in (6).

HABENARIA BLEPHARIGLOTTIS (Willd.) Torr. Lewis Co.: Beaver Lake, Watson, *B. D. Gilbert* (8), xxxii. 366. Herkimer Co.: Frankfort Hill near Wetmore's Pond (2). Oneida Co.: South Trenton; borders of rock Lake (2). Madison Co.: Fiddlers Green, Peeksport, near Eaton, *H. D. House* (8), 1913, p. 29. Rensselaer Co.: Cranberry Marsh, Sand Lake, *C. H. Peck* (11b), 1910, p. 71; Van Rensselaer Swamp, 1903, *E. M. Cipperly* (9). Orange Co.: Spruce Pond, 25 miles E. of Southfields, *Millspaugh* (8), xi. 134. Westchester Co.: Lake Mohegan, *T. W. Martins, Jr.* (8), xvi. 124. Rockland Co.: Tuxedo Park (17). Richmond Co.: Mariner's Harbor, *R. G. Eccles* (8), xviii.

214. Suffolk Co.: Babylon, and along S. shore (8), iv. 98; Barton, *Miller* (8), vii. 17; Patchogue, *W. T. Davis* (8), xxii. 462. Long Island and Staten Island (17). Tioga Co.: near Owego, *Millspaugh* (3). Chenango Co.: Smithville, *Coville* (3). Cortland Co.: Labrador Swamp, Truxton, 1889, *K. M. Wiegand* (21); 1894, *W. W. Rowlee* (9). Onondaga Co.: Centerville, Cicero Swamp (5); Beaver Lake, *Beauchamp* (8), xxxii. 366; Mud Lake, Baldwinsville, 1897, *W. W. Rowlee* (9). Oswego Co.: Mud Lake, 1878, *F. L. Kilborne* (9); Lily Marsh, 1895, *W. W. Rowlee* (9), and *H. D. House* (11), 1914, p. 50. Cayuga Co.: bogs E. and N. E. of Duck Lake, Conquest, August 12, 1916, and Featherbed Bog, Victory, August 13, 1916, *L. Griscom, A. H. Wright, F. P. Metcalf* (10). Seneca Co.: W. Junius (9), (10). Monroe Co.: Mendon, *M. S. Baxter* (4). Chautauqua Co.: Hanover (6).

Pogonia verticillata (Willd.) Nutt. Lewis Co.: *F. B. Hough*, very rare, (22b), 1846. Oneida Co.: Oriskany Swamp, *Dr. Knieskern* (1), and *Vasey* (2); mossy bogs on plains of Rome, along R. R., *J. H. Paine, Jr.* (8), xxxii. 377. Madison Co.: Eaton, 1840, *Dr. Bradley* (1); and *H. D. House* (11), 1913, p. 30; Fiddlers Green, 1905, *H. D. House* (8), xxxii. 377. Schenectady Co.: in the pine plains, *Pearson* (2). Dutchess Co.: *A. Winchell* (22c), 1851. Common S. of moraine on Long Island, Staten Island and up Hudson River Valley to Dutchess Co. (17). Broome Co.: N. W. of Binghamton, *Clute* (3). Tompkins Co.: Caroline Hills, Danby Hills, 1881–1882 (9). Onondaga Co.: Otisco, Cicero swamp, Beaver Lake (5); Kirkville, 1902, *House* (8), xxxii. 377. Oswego Co.: Lily Marsh, 1879, *C. S. Sheldon*, 1891, *W. W. Rowlee* (9), and *H. D. House* (11), 1914, p. 25. Cayuga Co.: bogs N. E., E. and N. of Duck Lake, Conquest, June, July, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf;* Featherbed Bog, Victory, August 12, 1916, *F. P. Metcalf, L. Griscom* (10).

Pogonia trianthophora (Sw.) BSP. Oneida Co.: Pine Plains of Rome, *Knieskern* (2). Madison Co.: Eaton near Leland's upper pond, *Bradley* (2). Reported from vicinity of New York city but not recently collected (17). Onondaga Co.: Beaver Lake, Tamarack Swamps, Geddes Woods (5); Round Lake, Fayetteville (8), vi. p. 192; Kirkville, *Underwood* (8), xxxii. 377. Cayuga Co.: woods N. of Spring Lake, Conquest, August 12, 1916, *L. Griscom, A. H. Wright, F. P. Metcalf* (10). Seneca Co.: Sheldrake Point, Cayuga Lake, *Gray* (2). Wayne Co.: woods near Savannah, *C. H. Peck* (11), 1872, p. 88; near Lake shore, North Rose, 1906, *Ruth Weed* (9); Arbor Vitae-tamarack Swamp, N. E. corner Butler, August 13, 1916, *A. H. Wright, L. Griscom, F. P. Metcalf.* Ontario Co.: Gorham, *Sartwell*, in Herb. Hamilton College (2). Monroe Co.: Parma, *Bradley*, and Brockport, *Lennon* (4); Webster and Adams' Basin, *M. S. Baxter* (4). Orleans Co.: Yates, *Miss F. Beckwith* (4). Erie Co.: West Seneca near Smoke's Creek, *Junius S. Smith* (6).

Arethusa bulbosa L. Lewis Co.: *F. B. Hough* (22b), 1846.

Oneida Co.: Oriskany swamp, *Gray* (2); formerly at Flats of Mohawk below Utica (2); Moss Marsh beyond Fort Bull and Rome (2). Schenectady Co.; Major VanVoosts Fly, *Pearson* (2). Delaware Co.: *M. Platt* (22e), 1841. Dutchess Co.: rare and local (17). Suffolk Co.: near Hook Pond, East Hampton, *E. S. Miller* (8), vi. 157; Wading River, 1877, *E. S. Miller* (9). Increasing and frequent southward particularly in Long Island not recorded from Staten Island (17). Cortland Co.: Homer, *G. W. Bradford* (22d), 1833; Labrador Swamp, Truxton, 1893, *K. M. Wiegand* (21), and *Beauchamp* (8), xxxii. 377. Tompkins Co.: Freeville Swamp, Dryden, 1875, *E. H. Palmer* (9). Onondaga Co.: infrequent, Tamarack Swamp (5); Cicero Swamp, Beaver Lake, *Beauchamp* (8), xxxii. 377; E. of Syracuse, *F. Bell, H. D. House* (8), xxxii. 377. Oswego Co.: collection of *C. S. Sheldon* (11), 1914, p. 25; Mud Lake, 1888, *H. L. Stewart* (9). Cayuga Co.: Featherbed Bog, southern portion Victory, June 11, 1916, *F. P. Metcalf, L. Griscom, A. A. & A. H. Wright* (10). Seneca Co.: Junius, *Sartwell*, in Herb. Hamilton College (2). Genesee Co.: West Bergen Swamp (2). Cattaraugus Co.: Machias (6). Chautauqua Co.: Hanover and Cassadaga Lake (6).

Serapias Helleborine L. Herkimer Co.: Mohawk River Flats, Little Falls, *Mrs. L. Burrell* (11), 1914, p. 41. Madison Co.: Cazenovia, Sept. 2, 1915, *Edith Webster* (10). Tompkins Co.: near Newfield, 1890–1916, *Mrs. James;* ravine N. of Beech Woods, Six Mile Creek, Ithaca, August 19, 1916, *F. P. Metcalf* (10). Onondaga Co.: Geddes Gorge, August 1879 (5); Otisco, *W. W. Munson* (11), 1888, p. 132. Oswego Co.: near Fairhaven, Sterling, 1916, *P. Munz* (10). Cayuga Co.: near Auburn, 1904, *G. W. Boynton* (9); woods near Stark Pond, Conquest, July 2, 1916, *L. H. MacDaniels* (10); Nichols Woods, N. of Duck Lake, Victory, August 12, 1916, *F. P. Metcalf, L. Griscom* (10); Botrychium Woods N. of Spring Lake, Conquest, August 11 and 12, 1916, *L. Griscom, A. H. Wright, F. P. Metcalf.* Wayne Co.: N. E. corner Butler, August 13, 1916, *F. P. Metcalf, L. Griscom, A. H. Wright* (10); abundant in woods S. W. of North Rose, Rose, 1915–1916, *A. R. Weed;* woods in S. E. corner of Rose, October 5, 1916, *A. H. Wright, F. P. Metcalf* (10). Ontario Co.; Canandaigua, *E. J. Durand* (8), xxiii. 354. Monroe Co.: Webster, *M. S. Baxter;* Forest Lawn, *Mrs. H. G. Pierce;* North Rush and Henrietta, *E. H. Clapp;* Oak Orchard Creek, *W. H. Lennon* (4a), 1910; Golah; East shore Irondequoit Bay, *Killip & Woodams;* Rattlesnake Point, *Mrs. White,* (4b), 1916. Seneca Park, Rochester, 1916, *Effie Riley* (10). Orleans Co.: 7 mi. S. E. and 3 mi. S. E. of Medina, *L. H. Wild* (9). Niagara Co.: shaded roadside, Wilson, August 24, 1915, *A. J. Eames* (10). Erie Co.: near Scajauquady's Creek, 1882, *Edna M. Porter* (6a).

Listera australis Lindl. St. Lawrence Co.: a single plant in large swamp near Fine, August, *C. H. Peck* (11), 1909, p. 35. Fulton Co.: Canada Lake, 1912, *C. P. Alexander,* and 1913, *A. Olsson* (11), 1913,

p. 26. Onondaga Co.: occasional, Cicero Swamp (5); near Baldwinsville, 1885, *Beauchamp & Underwood* (16). Oswego Co.: Lily March, 1876, *A. Wibbe*, and 1879, *C. S. Sheldon*, later *C. S. Sheldon, W. W. Rowlee* (16), (11), 1909, p. 31; Granny's Orchard, E. Palermo, 1894, *W. W. Rowlee* (9). Cayuga Co.: bog E. of Duck Lake, Conquest, June 11, 1916, *L. Griscom, A. A. & A. H. Wright, F. P. Metcalf*, also July 1, 1916, *K. M. Wiegand, L. H. MacDaniels* (10); rich woods E. side of Featherbed Bog, Victory, June 11, 1916, *L. Griscom, A. A. & A. H. Wright, F. P. Metcalf*, and July 1, 1916, *K. M. Wiegand* (10).

MICROSTYLIS UNIFOLIA (Michx.) BSP. Richmond Co.: Egbertville, *Mrs. N. L. Britton* (8), xvi. 135; Ocean Terrace, *C. A. Timmerman* (8), xviii. 214. Long Island, mostly N. of the moraine, Staten Island and increasing northward (17). Chenango Co.: open woods, Oxford, *Coville* (3). Tioga Co.: North Woods, Oakley Corners, Owego, July 26, 1914, *H. M. Mapes* (10). Tompkins Co.: woods, Malloryville Bog, Dryden, August 30, 1915, *A. J. Eames, A. C. Fraser* (10). Onondaga Co.: Carpenter's Road, *H. D. House* (11), 1913, p. 39. Cayuga Co.: woods, N. W. of Featherbed Bog, Victory, August 12, 1916, *A. H. Wright, F. P. Metcalf, L. Griscom* (10).

SALIX CANDIDA Flügge. Lewis Co.: *F. B. Hough* (22b), 1846. Herkimer Co.: Mud Lake, State Marsh, Hidden Lake, Litchfield (2). Otsego Co.: Summit Lake Borders (2). King Co.: *J. B. Zabriskie* (22a), 1885. Dutchess Co.: *A. Winchell* (22c), 1851. Tompkins Co.: Fleming Meadows, Ithaca, (12), (14), and 1914, *C. C. Thomas* (10). Onondaga Co.: frequent in Cold Bogs (5); shore of Tully Lake, 1898, *G. T. Hastings* (9), and 1913, *K. M. Wiegand* (10); Labrador Swamp, 1893, *K. M. Wiegand* (9). Oswego Co.: Fulton, 1887, *H. L. Stewart* (9); Van Burin's Bog, New Haven, 1895, *W. W. Rowlee* (9); Paradise Swamp, N. Palermo, 1895, *W. W. Rowlee, K. M. Wiegand* (9); Paddy Lake, Scriba, 1897, *W. W. Rowlee* (9). Cayuga Co.: Locke Pond (12); Miller's Bog near Spring Lake, Conquest, June 10, 1916, *F. P. Metcalf, A. A. & A. H. Wright, L. Griscom* (10); boggy woods, N. end of Otter Lake, Cato, July 2, 1916, *L. H. MacDaniels* (10). Wayne Co.: Newark, 1880, 1882, *E. L. Hankenson* (9); Tamarack Swamp, S. W. of Savannah (12); Tamarack Swamp, N. E. corner Butler, July 3, 1916, *K. M. Wiegand, A. J. Eames, F. P. Metcalf* (10). Seneca Co.: Junius, *Sartwell* (12). Monroe Co.: marsh head of Irondequoit Bay, *Dr. C. M. Booth* (4); Riga, *Miss F. Beckwith* (4); Adams' Basin, *M. S. Baxter* (4); Mendon, *G. T. Fish* (4). Livingston Co.: Caledonia, *Clinton* (4). Genesee Co.: West Bergen (2).

PYROLA ASARIFOLIA Michx., var. INCARNATA (Fisch.) Fernald. Lewis Co.: *F. B. Hough* (22b), 1846. Herkimer Co.: Mud Lake, Warren (2). Fulton Co.: Cold Springs, Gloversville, *A. Olsson & C. P. Alexander* (11), 1913, p. 27. Oneida Co.: Oriskany, *Dr. Knieskern* (1); Litchfield Marshes (2). Otsego Co.: abundant in marshes near Summit Lake near source of Otsquago Creek and Susquehanna R. (2). Madison Co.: (11), 1913, p. 27. Onondaga Co.: Jamesville

Swamp, Jamesville Road (5). Oswego Co.: (11), 1913, p. 27. Cayuga Co.: Hemlock-tamarack Woods N. of Miller's Bog, near Spring Lake, Conquest, June 10, 1916, *L. Griscom, A. A. & A. H. Wright, F. P. Metcalf* (10). Wayne Co.: in the Tamarack Swamp, S. E. of Savannah (12); Arbor Vitae-tamarack Swamp, near Turtle Pond, N. of Savannah, June 12, 1916, *L. Griscom, A. A. & A. H. Wright, F. P. Metcalf* (10); Arbor Vitae-tamarack Swamp, S. W. of Westbury, Butler, July 7, 1916, *F. P. Metcalf, A. H. Wright, K. M. Wiegand* (10). Erie Co.: Tonawanda Reservation, 5 mi. E. of Akron, *D. F. Day & G. W. C.* (11), 1866, p. 205.

GERARDIA PAUPERCULA Britton. Columbia Co.: Copake Falls (17). Richmond Co.: rare (17). Rare on N. shore Long Island, Staten Island (17). Oswego Co.: Mud Lake, Hannibal, *C. S. Sheldon* (11), 1914, p. 48, and *W. W. Rowlee,* 1894, (9); sand dunes, N. of Selkirk, 1902, *W. W. Rowlee, K. M. Wiegand* (9). Cayuga Co.: springy place, N. of Spring Lake, near roadside, Conquest, August 11 and 12, 1916, *L. Griscom, A. H. Wright, F. P. Metcalf* (10).

VALERIANA ULIGINOSA (T. & G.) Rydb. Herkimer Co.: Warren (12). Dutchess Co.: Pine Plains (12). Onondaga Co.: occasional (5). Wayne Co.: Newark, *E. L. Hankenson* (12), Savannah, 1833, *Sartwell* (12); abundant in bogs and Arbor Vitae Swamp near Turtle Pond, S. of E. Butler, Savannah, June 12, 1916, *A. A. & A. H. Wright, L. Griscom, F. P. Metcalf* (10); Arbor Vitae-tamarack Swamp, N. E. corner Butler, July 2, 1916, *K. M. Wiegand, A. H. Wright, F. P. Metcalf* (10). Seneca Co.: Junius, 1827, herb. of J. J. Thomas (12). Monroe Co.: Mendon Swamp, *G. T. Fish* (4); Powder Mills also Periton and Buchnell's Basin (4a). Genesee Co.: West Bergen Swamp (12).

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(1) **Torrey, John** — Flora of New York, 1843.
  (a) List of plants described in the State Flora and of plants discovered and collected since the publication of the flora, Cat. Cab. Nat. History, N. Y. pp. 1–61, Albany, 1853.

(2) **Paine, John A., Jr.**— Catalogue of plants found in Oneida Co. and vicinity in Report of State Botanist, pp. 53–193, 1865.

(3) **Clute, W. N.**— Flora of the Upper Susquehanna Valley, 1898.
  (a) Supplement number one in Report of State Botanist, pp. 57–60, 1903.

[1] The titles given here cover all the known stations in the state for the species treated; lesser publications were omitted where more recent floras covered the work completely; in some cases, however, where records were omitted by recent floras, the references to the older publications have been given.

(4) **Beckwith, Florence; Macauley, Mary E.; Fuller, J. B.**— Flora of Monroe Co., Proceedings of the Rochester Academy of Science, iii. pp. 1–150, 1896.

(a) Supplement number one, Proceedings of the Roch. Acad. Science, v. pp. 1–38, 1910.

(b) Supplement number two, on manuscript, 1916.

(5)[1] **Goodrich, L. Leonora Hutchinson** — Flora of Onondaga Co., Syracuse, N. Y., 1912.

(6) **Day, David F.**— Flora of Buffalo, 1882.

(a) Supplement number one, 1883.

(7) **Rhodora** (complete), 1899–1916.

(8) **Torrey Botanical Club, Bulletin of** (complete), 1870–1916, including Floras and Lists of Plants from Richmond, Suffolk, Chenango, Westchester and Dutchess Counties.

(9) **Herbarium of College of Arts and Sciences,** Cornell University, Ithaca, N. Y.

(10) **Herbarium of New York State College of Agriculture,** Cornell University, Ithaca, N. Y.

(11) **Report of State Botanist,** 1848–1915, in the Annual Report of the Regents of the Univ. of the State of N. Y. on the condition of the State Cabinet of Natural History, continued as the Annual Reports of the Regents of the University in the New York State Museum or in N. Y. State Museum Bulletins.

(a) Plants of North Elba, Essex Co. (Peck, C. H.), 53rd Report, pp. 67–237, 1899.

(b) Plants of Cranberry Marsh, Sand Lake, Rensselaer Co., 57th Report, pp. 69–72, 1903.

(c) Plants of Averyville Marsh, North Elba, Essex Co., 57th Report, pp. 72–73, 1903.

(12) **Dudley, W. R.**— The Cayuga Flora, 1886.

(13) **Peck, C. H. and House, H. D.**— Carices of New York, in 44th Report of State Botanist, pp. 188–202, 1894.

(14) **Rowlee, W. W. and Wiegand, K. M.**— Salix candida Willd, and its hybrids, Bulletin of Torrey Botanical Club, xxiii. 194–201.

(15) **Britton, N. L.**— Revision of Eleocharis; Trans. St. Louis, Acad. of Sciences, iv. 358–390, 1882.

[1] **Many records here will have to be regarded as questionable; as a number of the rarest plants are given as common or frequent with no data to substantiate the statement.**

(16) **Wiegand, K. M.**— Revision of the genus Listera; Bulletin of Torrey Botanical Club, April 1899.

(17) **Taylor, Norman** — Flora of the Vicinity of New York City, 1915.

(18) **Engelmann, Geo.**— Revision of N. American Species of Juncus; Trans. St. Louis, Acad. Sciences, ii. pp. 424–498, 1868.

(19) **Fenno, F. E.**— Flora of Susquehanna Valley and adjacent hills of Tioga Co. in Report of State Botanist, pp. 47–160, 1902.

(20) **Day, David F.**— Catalogue of the Flowering and Fern-like Plants in vicinity of Niagara Falls, 4th Ann. Report. Comm. Niag. State Reservation, 1888.

(21) **Personal herbarium of K. M. Wiegand** and Record of plants seen in Vicinity of Cortland Co.

(22) **Ann. Report of Regents** in N. Y. Senate Documents.

(a) **Zabriskie, John B.**— Catalogue of Plants, Vicinity of Erasmus Hall, Kings Co., 48th Report, pp. 176–181, 1835.

(b) **Hough, F. B.**— Catalogue of Plants of Lewis Co., 59th Report, pp. 249–283, 1846.

(c) **Winchell, A.**— Catalogue of Plants growing in the Vicinity of Amenia Seminary, Dutchess Co., 64th Report, pp. 256–279, 1851.

(d) **Bradford, Geo. W.**— Catalogue of Plants growing in the Vicinity of Cortland Academy, Homer, Cortland Co., 46th Report, pp. 66–71, 1833.

(e) **Platt, M.**— Plants collected by Botanical Class in the Delaware Literary Institute, summer of 1840, Delaware Co., 54th Report, pp. 227–231, 1841.

Cornell University.

ORCHIDS FOUND IN THE REGION OF ASQUAM LAKE.

Albert Edgar Lowenstein.

In the following list are enumerated the *Orchidaceae* found by the members of Camp Algonquin, Holderness, New Hampshire. The region explored was bounded roughly as follows: on the north by Mt. Israel, on the east by Red Hill, on the south by the town of Ashland, and on the west by Mt. Prospect. This district includes all of Asquam Lake. The Squam Range runs from southwest to northeast through the central part of the region.

During the last five years the boys of the camp have scoured this section thoroughly, and have made up a list of some 750 plants. A list of animals has also been made. Of the orchids here mentioned a practically complete series has been contributed to the herbarium of the New England Botanical Club.

CYPRIPEDIUM L.

C. parviflorum Salsib. Rare; one record, Squam Mtn.
C. acaule Ait. Abundant; the commonest orchid.

HABENARIA Willd.

H. bracteata (Willd.) R. Br. Locally common.
H. hyperborea (L.) R. Br. Locally abundant; only found in one place to my knowledge, but very common there.
H. dilatata (Pursh) Gray. Rare; Squam Mtn.
H. clavellata (Michx.) Spreng. Common.
H. Hookeri Torr. Common near the lake.
H. orbiculata (Pursh) Torr. Generally found with the last.
H. lacera (Michx.) R. Br. Common.
H. psycodes (L.) Sw. Common.
H. Andrewsii White. Rare; only two records, Centre Harbor.
H. fimbriata (Ait.) R. Br. Common.

POGONIA Juss.

P. ophioglossoides (L.) Ker. Only known to grow in one locality, but rather common there.

P. TRIANTHOPHORA (Sw.) BSP. Probably the commonest orchid next to *Cypripedium acaule*, more than 5000 plants found in 1916.

SPIRANTHES Richard.

S. GRACILIS (Bigel.) Beck. Common.
S. CERNUA (L.) Richard. Common.
S. CERNUA var. OCHROLEUCA (Rydb.) Ames. Rare.
S. ROMANZOFFIANA Cham. Common.

EPIPACTIS [Haller] Boehm.

E. REPENS var. ophioides (Fernald) A. A. Eaton. Common.
E. TESSELATA (Lodd.) A. A. Eaton. Common.
E. PUBESCENS (Willd.) A. A. Eaton. Common.

LISTERA R. Br.

L. CORDATA (L.) R. Br. Local; Squam Mountain (*M. L. Fernald*).

CORALLORHIZA [Haller] R. Br.

C. MACULATA Raf. Common.
C. TRIFIDA Chatelain. Local; Squam Mtn.

MICROSTYLIS (Nutt.) Eaton.

M. UNIFOLIA (Michx.) BSP. Rare; three records.

LIPARIS Richard.

L. LOESELII (L.) Richard. Rare; only one record.

N. B. *Arethusa bulbosa* L. has been reported from the region, but we have not found it. For the record of *Listera cordata* R. Br. I am indebted to Prof. Fernald.

PROVIDENCE, RHODE ISLAND.

HELIANTHEMUM DUMOSUM ON THE MAINLAND OF NEW ENGLAND.

M. L. Fernald.

In 1913 Mr. E. P. Bicknell described as *Crocanthemum dumosum* [1] a plant of Nantucket, Martha's Vineyard and Long Island which, as indicated by him, is abundantly distinct from *Helianthemum canadense*, with which it has been confused. The plant, which is certainly a good species, blooming earlier than *H. canadense* and much earlier than *H. majus*, is, however, not confined to the islands mentioned; but the collections of the Gray Herbarium and of the New England Botanical Club show it to occur also on Block Island, where Mr. Long and the writer found only this species of the genus; on Nashawina, where Mrs. Northrop collected it in 1903; and quite generally on the barrens of Cape Cod, specimens in the herbarium of the New England Botanical Club showing it to extend from Sandwich to Chatham and Eastham. Prof. J. F. Collins and the writer found it also on the mainland of Rhode Island in South Kingstown in 1914.

In publishing the species Bicknell places it in *Crocanthemum* rather than in *Helianthemum*, the inclusive genus to which these plants have long been referred. In doing so he presumably follows Britton in the second edition of the *Illustrated Flora* where the American plants are placed in *Crocanthemum* of Spach and are said to be "with showy yellow flowers, and with other much smaller apetalous cleistogamous ones," a genus with "Type species: *Crocanthemum carolinianum* (L.) Spach." [2]

It is somewhat singular, if *Crocanthemum* is a distinct genus on account of its small apetalous cleistogamous flowers, that Spach, in publishing *Crocanthemum* with the type species *C. carolinianum*, should have overlooked this fact and should have distinctly given as the leading character of *Crocanthemum:* "Flores omnes 5-petali"; while the American plants with apetalous cleistogamous flowers he placed in a separate genus, *Heteromeris*.[3] There is little question that the type of *Crocanthemum, C. carolinianum*, lacks the apetalous

[1] Bicknell, Bull. Torr. Bot. Club, xl. 613 (1913).
[2] Britton in Britton & Brown Ill. Fl. ed. 2. ii. 539 (1913).
[3] Spach, Ann. Sci. Nat. sér. 2. vi. 370 (1836).

cleistogamous flowers which Britton makes characteristic of the genus. At least, the herbarium specimens fail to show them; Spach, in publishing *Crocanthemum*, with *C. carolinianum* as the type, distinctly stated that the flowers were all petaliferous; and Barnhart, in his key to *Helianthemum* in the second edition of Small's *Flora of the Southeastern United States*, separates *H. carolinianum* from the other southeastern species by its having "Flowers all alike and petaliferous."[1] Incidentally, *H. carolinianum* is a plant with stems and calyces hirsute, while the species with apetalous cleistogamous flowers have the pubescence chiefly canescent-tomentulose or pannose. If it is justifiable to separate the plants with apetalous cleistogamous flowers as a genus, it would seem that they should not be forced into *Crocanthemum*, which is characterized by its lack of such flowers, but should be maintained in Spach's extreme sense as *Heteromeris*. The characters used by Spach in distinguishing the genera proposed by him as segregates from *Helianthemum* are chiefly of the "more or less" type and, until they are better checked than has been done by those American botanists who have recently taken up *Crocanthemum* in a sense not intended by the author of the genus, it is wise to leave the plants in *Helianthemum*, where their status is free from question.

It is noteworthy in this connection that even Dr. Britton, under *Crocanthemum* in the *Illustrated Flora*, inserts after *C. majus* a newly recorded species for the region, not as *Crocanthemum* but as *Helianthemum georgianum*, thus indicating that the change to *Crocanthemum* was made at the last moment and apparently without very careful study of the question.

Such characters as the length of the style and its straight rather than curved tendency, upon which stress has been laid by students who have attempted to segregate *Helianthemum* into genera, as, for instance, Grosser[2] in *Das Pflanzenreich*, where our plants are placed in *Halimium*, quickly fail and it is doubtful if these characters are of greater value than in many other genera, such, for instance, as *Carex*, in which we find long or short, straight or curved styles. For example, Grosser's Fig. 18, I, shows the flower of a *Helianthemum* (a genus with styles said to be usually curved) with the style quite as straight and as short as in his Fig. 9, G and H, illustrating *Halimium rosmarinifolium*, a characteristic North American plant which is certainly

[1] Barnhart in Small, Fl. SE. U. S. ed. 2, 796 (1913).
[2] W. Grosser in Engler, Das Pflanzenr. IV. pt. 193 (1903).

congeneric with *Helianthemum canadense* and *H. majus*. Other distinctions, in the embryo, etc. have been suggested, but it is extremely doubtful if these have been checked in all our species. At least, the writer, finding himself unable with his present knowledge of the group to maintain *Crocanthemum* for the plants of northeastern America, thinks it better to treat the plants as belonging to a subgenus under *Helianthemum*, a course which has commended itself to many scholarly students in the past. The low early-flowering species of the coastal region of southern New England and New York should then, as a Helianthemum, be called

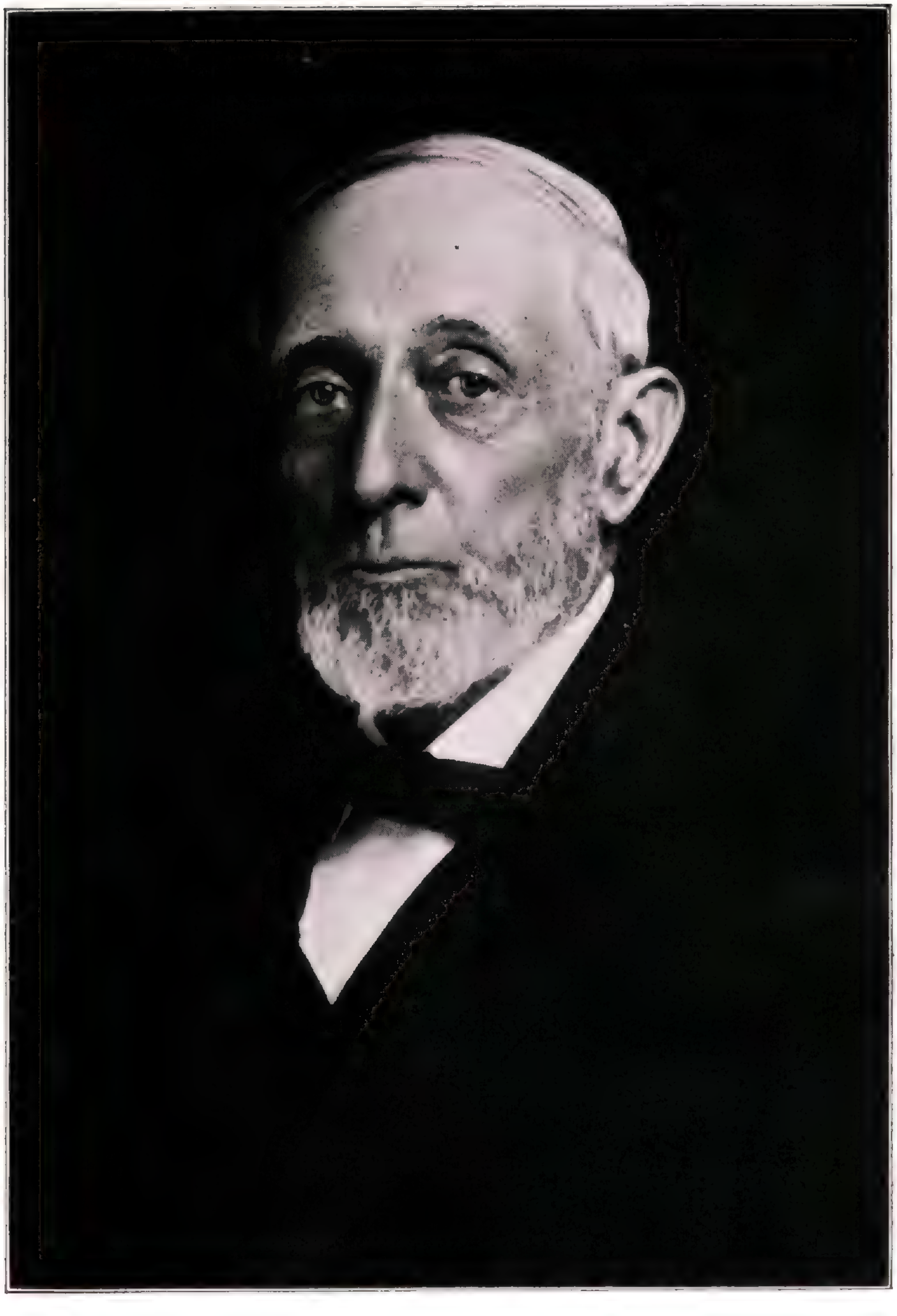
Helianthemum **dumosum** (Bicknell), n. comb. *Crocanthemum dumosum* Bicknell, Bull. Torr. Bot. Club, xl. 613 (1913).

Gray Herbarium.

Glandularity on Veronica Anagallis-aquatica L.— The seventh edition of Gray's Manual describes *Veronica Anagallis-aquatica* L. as smooth. However, specimens collected in Sheffield and Stockbridge, Massachusetts, have the stem and branches of the inflorescence thickly clothed with glandular pubescence. Three specimens in the Gray Herbarium from England, Bohemia, and France are smooth, while one from the Azores is glandular. In America the glandular form has been collected at Tinmouth, Vermont; Newark, New York; Lancaster, Pennsylvania; and Berkshire County, Massachusetts. The smooth one, on the other hand, has been found in Ipswich, Massachusetts, in New Jersey, Pennsylvania, Missouri, New Mexico, Arizona, Oregon, and Assiniboia. A specimen from Virginia has the inflorescence glandular and the stem smooth. Further collection and examination of material of this species is needed to determine the constancy, geographic bearing, or taxonomic significance of these differences. In any event it appears that the description in the Manual should read "smooth or glandular." — Ralph Hoffmann, Kansas City, Missouri.

Vol. 19, no. 218, including pages 21 to 40, was issued 14 February, 1917.

ABNORMAL FLOWERS OF OXALIS STRICTA.



Very sincerely yours,
E. G. Rice.

Rhodora

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REV. E. J. HILL.

AGNES CHASE.

(With portrait.)

ELLSWORTH JEROME HILL was born at Le Roy, New York, December 1, 1833, the son of a farmer of colonial stock from Connecticut. His alert mind and eagerness for knowledge made the most of the local facilities for education, while a love of natural history and of reading led to the study of geological works and of the classics. At 19, when about prepared to enter college, he was seized with an affection of the knee, causing lameness. He never afterward had good health, all that he accomplished being in spite of the handicap of pain and weakness. It was during this first period of lameness that he began the study of botany. His first effort to walk out of doors on crutches was made to secure from the orchard a few early spring flowers which he identified by Wood's Botany. During the summer he thus collected and studied some two hundred specimens that are still preserved in his herbarium. The following year he went to Mississippi, and there taught in a female seminary at Grenada and later in a preparatory school for boys. After three years, much improved in health, he returned to New York where he taught for two years. In 1860 he entered Union Theological Seminary, graduating in the class of 1863. He then married and went to Homewood (near Chicago), Illinois, as pastor of the Presbyterian Church. In 1869 hip disease developed rendering him lame for several years. In consequence he resumed teaching, first in the high school of Kankakee, Illinois, for four years, then in the Englewood high school, Chicago, for eighteen years.

He made rich collections in the sand barrens and swamps about Kankakee, discovering *Sphaeralcea remota*, still known only from the island in the Kankakee River where he found it. Most of these collections were made while he walked on crutches or with two canes. He told me that he carried his vasculum over his shoulder and a camp stool with his crutch or cane in one hand. To secure a plant he would drop the camp stool, which opened of itself, then he would lower himself to the stool and dig the plant. He recovered from his lameness but often suffered acute pain from cold or wet or overexertion. But this did not deter him from making botanical trips that would have taxed a more robust man — in the dunes I have seen him tire out more than one able-bodied man. While teaching in Chicago he spent many of his vacations on extended trips, visiting the Saguenay region in Quebec, the Menominee iron region in upper Michigan, and other places about Lake Superior, and in northern Wisconsin.

Mr. Hill made a critical study of several difficult genera, particularly Potamogeton, Carex, Quercus, Prunus, Salix and Crataegus. The last ten or twelve years were mostly devoted to the study of mosses. Unfortunately his modesty often prevented his publishing his conclusions. His note-books, filled with detailed observations and comparisons, contain full descriptions of several species written long before they were published by others. His bibliography, of 162 titles, shows the range of his botanical interest. He was a correspondent of Dr. Gray and Dr. Watson, contributed specimens and critical notes to Dr. Morong for his work on Potamogeton, and made extensive field studies of Crataegus for Prof. Sargent. It was characteristic of him to give unsparingly of his knowledge to further the work of others, great or small, from critical notes for Prof. Sargent to helping me with a puzzling Carex or elucidating the German-tinged Latin of some of Kunth's descriptions of grasses. He amassed an herbarium of some 16,000 sheets, much the greater part being his own collections, and an exceptionally fine botanical library.

The study of geology he carried on simultaneously with that of botany and the relation of the two he impressed on his students. Before the word ecology was invented he was calling our attention to the zones of vegetation about the sloughs in the dune region of northern Indiana and pointing out to us the successive stages by which vegetation converted the sloughs into dry land. He possessed the vision of plant life as a whole, seeing it as an active factor in building and shaping the surface of the earth.

In 1888, because of poor health and failing eyesight, he gave up teaching, but became the more devoted to botany. In the '90's his health improved and for several years from early spring till late fall he made from one to three or four excursions a week in the Chicago region, studying oaks and Crataegus particularly. It was my good fortune to accompany him on many of these excursions, serving, he used to say, as eyes for him. Many species hitherto unknown for the region were discovered in these days and his joy over them was no less than mine. His enthusiasm and his love of beauty were as fresh as a boy's, while his mature judgment and ripe knowledge made it a rare privilege to be in his company. He never lost his early love of the Greek and Latin classics and often he had a copy of Virgil in his pocket to read aloud during the resting periods.

The last ten or twelve years Mr. Hill devoted to the study of the mosses of the Chicago region. He left in manuscript detailed descriptions of 133 species. He put the manuscript into my hands and after it has been copied it is to be hoped the work may be published. His herbarium has been purchased by the University of Illinois.

Mr. Hill died January 22 at his home in Chicago. The last two years he was feeble physically but mentally as keen and alert as ever. He arose every day until the last, sitting in the room that had so long been his study, library and herbarium.

Three species of plants bear his name, Potamogeton Hillii, Crataegus Hillii and Carduus Hillii.

List of the scientific Writings of the Rev. E. J. Hill.

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2. A double-flowered Cypripedium spectabile. Amer. Nat. **12**: 816. 1878.

3. A new variety of Campanula rotundifolia L. Amer. Nat. **12**: 817. 1878.

4. The number of stamens in Brasenia peltata. Amer. Nat. **13**: 254. 1879.

5. Prunus pumila. Amer. Nat. **13**: 649. 1879.

6. The fruit of Shepherdia canadensis. Amer. Nat. **13**: 699. 1879.

7. Potamogeton niagarensis Tuckerm. Amer. Nat. **13**: 699. 1879.

8. The geographical range of Petalostemon foliosus, Gray, in Illinois. Bot. Gaz. **4**: 239. 1879.

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11. Botanical notes. Bot. Gaz. **6**: 259. 1881.

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13. The action of acids on cellulose and starch-grains. Bot. Gaz. **7**: 87. 1882.

14. Potamogetons in western New York. Bull. Torrey Club **10**: 92. 1883.

15. Notes on Indiana plants. Bot. Gaz. **8**: 187. 1883.

16. Aster or Solidago? Bot. Gaz. **8**: 238. 1883.

17. Means of plant dispersion. Amer. Nat. **17**: 811, 1028. 1883.

18. Notes on Indiana plants, 1883. Bot. Gaz. **9**: 45. 1884.

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22. Some Indiana plants. Bot. Gaz. **10**: 262. 1885.

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24. A botanical diary. Bot. Gaz. **11**: 183. 1886.

25. Some Indiana plants. Bot. Gaz. **13**: 323. 1888.

26. Lactuca Scariola L. Bot. Gaz. **14**: 153. 1889.

27. Aster ptarmicoides, var. lutescens Gray. Bot. Gaz. **14**: 153. 1889.

28. Pinus Banksiana at the West. Bull. Torrey Club **17**: 64. 1890.

29. The revised manual and some western plants. Bull. Torrey Club **17**: 169. 1890.

30. Notes on the flora of the Lake Superior region. I., II. [with subtitle] The northern peninsula of Michigan. Bot. Gaz. **15**: 140, 159. 1890.

31. Hypericum Kalmianum and Lobelia Kalmii. Gard. & For. **3**: 370. 1890.

32. The hemlock in eastern Minnesota. Gard. & For. **3**: 553. 1890.

33. The autumn flora of the Lake Michigan pine barrens. Gard. & For. **3**: 594, 606, 618. 1890.

34. Notes on the flora of the Lake Superior region. II., III. [with subtitle] Vermilion Lake, Minnesota. Bot. Gaz. **15**: 304, 324. 1890.

35. Zizania as found by the explorers of the northwest. Bull. Torrey Club **18**: 57. 1891.

36. The fertilization of three native plants. Bull. Torrey Club **18**: 111. 1891.

37. Notes on the flora of the St. Croix region. Bot. Gaz. **16**: 108, 126. 1891.

38. Winter studies in the pine barren flora of Lake Michigan. I–IV. Gard. & For. **4**: 159, 195, 208, 232, 278, 304. 1891.

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40. Note [on Cornus Baileyi]. Bot. Gaz. **16**: 118. 1891.

41. The acorn crop near Chicago. Gard. & For. **4**: 610. 1891.

42. Winter rambles in the Pine barrens. I–III. Gard. & For. **5**: 16, 74, 110. 1892.

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44. Eye habits. Science **19**: 53. 1892.

45. The Crinkle Root. Meehan's Month. **2**: 22. 1892.

46. The Forest. Timber culture in eastern Nebraska. Gard. & For. **5**: 201. 1892.

47. Coontie and Conte. Gard. & For. **5**: 208. 1892.

48. Great productiveness of Cicuta bulbifera. Meehan's Month. **2**: 100. 1892.

49. Notes on the flora of Chicago and vicinity. Bot. Gaz. **17**: 246. 1892.

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53. Plants turning to the light. Meehan's Month. **3**: 5. 1893.

54. The coast dune flora of Lake Michigan. Gard. & For. **6**: 15, 51. 1893.

55. Chinese primroses at the Columbian Fair. Gard. & For. **6**: 94. 1893.

56. The name Tabernaemontana. Meehan's Month. **3**: 46. 1893.

57. Cyclamens at the Columbian Exposition. Gard. & For. **6**: 157. 1893.

58. Cinerarias at the World's Fair. Gard. & For. **6**: 178. 1893.

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60. Concerning prickly pears. Meehan's Month. **3**: 164. 1893.

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62. Viola palmata L. Meehan's Month. **4**: 4. 1894.

63. Potentilla recta L. Bull. Torrey Club **21**: 79. 1894.

64. Oaks in May. Gard. & For. **7**: 192. 1894.

65. A study of Quercus Leana. Bot. Gaz. **19**: 171. 1894.

66. The common names of Trillium. Meehan's Month. **4**: 84. 1894.

67. Titian and landscape. Meehan's Month. **4**: 110. 1894.

68. Wild roses about Chicago. Gard. & For. **7**: 322. 1894.

69. The Dahlia stalk-borer. Gard. & For. **7**: 388. 1894.

70. Prairie woodlands. Gard. & For. **7**: 412. 1894.

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73. [Salsola kali]. Purdue Univ. Agric. Expr. Sta. Bull. No. 52. **5**: 84. 1894.

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75. Salsola Kali tragus. Bot. Gaz. **19**: 506. 1894.

76. Tradescantia virginica var. villosa Watson. Bull. Torrey Club **22**: 71. 1895.

77. Hibiscus Moscheutos. Meehan's Month. **5**: 63. 1895.

78. The Saguenay region. I–III. Gard. & For. **8**: 182, 193, 213. 1895.

79. Notes on western New York woodlands. I., II. Gard. & For. **8**: 342, 382. 1895.

80. A season with the native orchids. I., II. Gard. & For. **8**: 412, 422. 1895.

81. Autumn flower show in Chicago. Gard. & For. **8**: 468. 1895.

82. Vaccinium vacillans with white fruit. Gard. & For. **8**: 503. 1895.

83. Early experiments in crossing plants. Gard. & For. **9**: 32. 1896.

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85. A natural garden. Gard. & For. **9**: 219. 1896.

86. Pyrus coronaria. Gard. & For. **9**: 258. 1896.

87. The bitternut hickory. Meehan's Month. **6**: 124. 1896.

88. Jackson park in June. Gard. & For. **9**: 288. 1896.

89. The Compass plant. Gard. & For. **9**: 337. 1896.

90. The sand dunes of northern Indiana and their flora. I–IV. Gard. & For. **9**: 353, 372, 382, 393. 1896.

91. Additional notes on Compass plants. Gard. & For. **9**: 407. 1896.

92. The fall exhibition of the Horticultural Society of Chicago. Gard. & For. **9**: 478. 1896.

93. Pellaea gracilis. Meehan's Month. **6**: 228. 1896.

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96. Potamogeton Robbinsii. Bot. Gaz. **25**: 195. 1898.

97. The extent of dodder parasitism. Pl. World **1**: 123. 1898.

98. Vitis labrusca and its westward distribution. Bull. Torrey Club **25**: 342. 1898.

99. Eleocharis melanocarpa a proliferous plant. Bull. Torrey Club **25**: 392. 1898.

100. Two noteworthy oaks. Bot. Gaz. **26**: 53. 1898.

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156. Characteristic features of the lake and peat swamp flora of Lake County, Illinois. Hist. Lake Co. Ill. 338. 1912.

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158. Notes on the distribution of Polytrichum strictum and some associated Sphagna. Bryologist **27**: 63. 1914.

159. Notes on plants of the Chicago region. Torreya **15**: 21. 1915.

160. Fontinalis Umbachii Cardot. Bryologist **18**: 10. 1915.

161. Notes on Funaria. Bryologist **19**: 35. 1916.

162. Fossombronia crispula in the dune region of Indiana. Bryologist **19**: 57. 1916.

Bureau of Plant Industry, Washington, D. C.

THE VARIATIONS OF POLYGONUM PENSYLVANICUM.

M. L. Fernald.

The common plant which is passing as *Polygonum pensylvanicum*[1] L. through the eastern half of the United States is an upright plant, often very tall, with the lanceolate to lance-ovate acuminate leaves usually quite glabrous upon both surfaces or sometimes with a mere trace of strigose pubescence upon the midrib beneath. The plant is so definitely glabrous, not only on the stem but on the foliage (the only pubescence being the pronounced glandularity of the peduncles), that it is often characterized in our American manuals as having the foliage glabrous beneath.

This plant with strictly or essentially glabrous foliage occurs generally from New Brunswick to South Dakota and Colorado and southward to the Gulf States, very often with the habit of a weed. Along the Atlantic seaboard, however, from eastern Massachusetts to South Carolina and presumably southward, as well as on the coastal plain of the Gulf of Mexico and inland through the Mississippi basin to southwestern Ontario, much of the plant with the characteristic bright-pink large flowers and the glandular peduncles of *Polygonum pensylvanicum* has the leaves very definitely strigose beneath and sometimes above, and frequently the upper ocreae are bristly-ciliate, thus departing conspicuously from the glabrous extreme which is more generally known as *Polygonum pensylvanicum;* and often, but by no means always, the leaves of the coastal plain plant are narrower than in the more widely dispersed glabrous-leaved plant. On the islands of southern New England, Nantucket and Block Island, another plant with the large achenes, rose-colored flowers and glandular peduncles of *Polygonum pensylvanicum*, differs very markedly from the commoner tendencies of the species in its habit, foliage and nearly suppressed peduncles. This extreme plant, which is said by

[1] The specific name *pensylvanicum* was consistently so written by Linnaeus and by his contemporaries, but in most modern works it has been made to agree with modern geographic usage and written "*pennsylvanicum*," apparently under the impression that an orthographic error is thus being corrected. Maps of the 18th century generally show the spelling *Pensylvania* so that it appears that Linnaeus, Lamarck and others who wrote the specific name with a single *n* in the first syllable were not committing an orthographic error but were following the authorized spelling of their day.

Mr. Bicknell to be the prevailing form on Nantucket, where, as on Block Island, it is characteristic of sandy pond-shores near the sea, has been beautifully described by Mr. Bicknell, who, apparently from his disinclination to recognize varieties, left the plant without a distinguishing name. Mr. Bicknell's description is so accurate and so clearly applies to the plant of Block Island as well as of Nantucket that it is here quoted:

"PERSICARIA PENNSYLVANICA (L.) Small. The common erect form of this plant with lanceolate tapering leaves and cylindric spikes of rather pale pink ovoid-oblong flowers is uncommon on Nantucket and was met with only twice — at Wauwinet and in Quaise. The prevailing form is mostly prostrate or ascending and is confined almost exclusively to the sandy shores of ponds near the ocean on the south and east sides of the island. In its extreme development it is notably different from the erect narrow-spiked form but appears to be a state of the latter, rather than an intrinsically diverse plant. By comparison it is characterized by short-oblong or even subglobose more densely flowered spikes, usually of a bright rose-color or carmine-red, although sometimes pale, the flowers shorter and almost orbicular in outline, the achenes rather larger, thicker, and more broadly orbicular, often more abruptly narrowed to a rather shorter style; the leaves are often marked above by a dark chevron and are commonly shorter, broader and less attenuate to a blunt or rounded apex and on shorter petioles, the upper most often sessile. The plant is often firmly prostrate and is sometimes very small, stems bearing mature spikes being sometimes only 1 dm. long." [1]

So far as the writer is able to determine this characteristic plant is known only from the two outer islands, Nantucket and Block Island, although it is naturally to be expected on the shores of Martha's Vineyard, the Buzzard's Bay region and Long Island. In its distribution it is coincident with many other extreme variations and localized species, and it seems to the writer well worthy varietal recognition.

We have, then, in eastern North America three well pronounced geographic variations passing as *Polygonum pensylvanicum* and the question naturally arises as to which was the plant of Linnaeus. In this particular case happily Linnaeus left no question, for he well describes the coastal plain plant with strigose or scabrous lower leaf-surfaces as having "Folia *lanceolata, acuminata, subtus ad modum scabra.*" [2]

These notes, which were originally based upon the material in the

[1] Bicknell, Bull. Torr. Bot. Club, xxxvi. 452 (1909).
[2] L. Sp. Pl. i. 362 (1753).

Gray Herbarium and the herbarium of the New England Botanical Club, have been augmented by an examination of the collections of the Academy of Natural Sciences of Philadelphia generously loaned for examination. In this collection, as it was learned by correspondence with Mr. Bayard Long, the strigose-leaved coastwise plant had already been discriminated, Mr. Long's letter of February 14, 1917, making the pertinent statement: "For several years we have had separated out a New Jersey thing with rough, generally narrow leaves and different-sized fruit, which I had been unable to place. *Most* of it is from Cape May along the edges of the salt marshes, but not always: while the broad-leaved, smooth-leaved common plant invariably looks like a weed or an introduction in our area." And on one of the field-labels of Mr. O. H. Brown, whose abundant collections from the Cape May Peninsula in the Herbarium of the Philadelphia Academy beautifully display typical *P. pensylvanicum*, Mr. Brown made the discriminating note: "This seems quite common near the town, and seems quite distinct from the *P. pennsylvanicum* of the fields."

The points above discussed may be summarized by the following synopsis:

A. Leaves copiously strigose beneath and often above: uppermost ocreae eciliate or frequently bristly-ciliate: achenes 2.2–2.8 mm. broad.

Polygonum pensylvanicum L., var. **genuinum**. *P. pensylvanicum* L. Sp. Pl. i. 362 (1753), originally described with "Folia *lanceolata, acuminata, subtus ad modum scabra.*" — Coastal region from Massachusetts to Mississippi, northward through the Mississippi basin to southern Ontario. The following specimens are characteristic. Massachusetts: Mill Dam, Brighton, August 19, 1853, *Wm. Boott;* North Scituate, September 1, 1897, *Sydney Harris;* Marshfield, September 10, 1898, *C. H. Morss;* Pocasset, Bourne, August 11, 1914, *F. S. Collins*, no. 2906; Hyannis, September 9, 1874, *Wm. Boott;* near Swan Pond, South Yarmouth, September 8, 1907, *E. W. Sinnott;* Yarmouth, September 3, 1910, *F. S. Collins*, no. 758; meadow, Eastham, September 11, 1909, *F. S. Collins*, no. 758; Chilmark, Martha's Vineyard, August 27, 1895, *Sydney Harris;* shore of Tashmoo Lake, Tisbury, Martha's Vineyard, July 30, 1911, *J. A. Cushman;* Nantucket, August 18, 1878, *E. & C. E. Faxon.* Rhode Island: damp border of Reservoir, Newport, September 21, 1901, *W. P. Rich;* dense wet thickets at borders of sphagnous swamps southwest of Harbor Pond, Block Island, August 19, 1913, *Fernald & Long*, no. 9409. New Jersey: Seaside Park, Ocean Co., August 30, 1908, *E. B. Bartram;* Delanco, August 23, 1910, *C. S. Williamson;* Mickleton, August 10, 1893, *Benjamin Heritage;* Avalon, September 7 and 8,

1895, *Ida A. Keller;* swamp, Cold Spring, August 22, 1915, *O. H. Brown*, no. 188 (white-flowered); wet ground east of Briar Island, Cold Spring, September 10, 1911, *O. H. Brown;* dry water hole, Cape May, September 10, 1911, *O. H. Brown;* low ground along marsh, Cape May, September 14, 1911, *O. H. Brown;* waste places in low grounds, Cape May, September 24, 1912, *O. H. Brown;* Race Course Pond, West Cape May, September 6, 1911, *O. H. Brown.* PENNSYLVANIA: Tinicum, Delaware Co., September 23, 1899, *B. H. Smith.* DELAWARE: Ruthby, September 12, 1893, *A. Commons.* VIRGINIA: Norfolk, September 6, 1893, *A. A. Heller*, no. 1241. SOUTH CAROLINA: Santee Canal, *Ravenel.* MISSISSIPPI: Saratoga, October 2, 1903, *Tracy*, no. 8768. MISSOURI: St. Louis, September, 1848, *Geo. Engelmann;* Meremac Highlands, St. Louis Co., October 30, 1910, *E. B. Bartram;* common along Swan, Swan, October 1, 1899, *Bush*, no. 705. ONTARIO: marsh at Arnes, near Kingsville, August 9, 1901, *J. Macoun*, Herb. Geol. Surv. Can. no. 54,758.

A. Leaves glabrous or at most sparsely strigose on the midrib beneath: ocreae usually all eciliate: achenes mostly 2.5–3.5 mm. broad. *B.*

B. Stems erect or strongly ascending: leaves lanceolate, acuminate: spikes cylindric, long-peduncled: flowers ovoid-oblong.

Var. **laevigatum**, n. var., a forma typica recedit foliis subtus glabris. — The very common form of the species, occurring from New Brunswick to South Dakota, Colorado, and southward. TYPE: Rumford, Rhode Island, July 6, 1903, *E. F. Williams*, in Gray Herb.

B. Stems depressed or subascending: leaves elliptic to oval, not acuminate, obtuse or rounded at apex: spikes short-ellipsoid to subglobose, short-peduncled to sessile: flowers suborbicular.

Var. **nesophilum**, n. var., depressum vel subadscendens, ramis 1–2.5 dm. longis; foliis glabris ellipticis vel ovalibus nec acuminatis apice obtusis vel rotundatis crassis 3–5 cm. longis breviter petiolatis vel subsessilibus; spicis breviter ellipsoideis vel subglobosis 0.5–1.8 cm. longis breviter pedunculatis vel sessilibus; floribus suborbicularibus roseis.— Sandy pond-shores near the sea, Nantucket Island, Massachusetts, and Block Island, Rhode Island. MASSACHUSETTS: described by Bicknell as the prevailing form on Nantucket.— Bull. Torr. Bot. Club, xxxvi. 452 (1909). RHODE ISLAND: sandy border of a pond close to the ocean, northern end of Block Island, September 28, 1916, *J. F. Collins, Perley Spaulding and G. F. Gravatt* (TYPE in Gray Herb.).

GRAY HERBARIUM.

SIEGESBECKIA ORIENTALIS IN ILLINOIS.

Earl E. Sherff.

Prior to his death in 1882, Elihu Hall had gradually built up a large private herbarium, consisting of specimens from many parts of the world. A good portion of these were collected by himself in the western United States and determined by Asa Gray.[1]

It was Mr. Hall's custom to take seeds from various specimens collected by himself or obtained through exchange and to plant these upon his large estate near Athens, Illinois. This was done for several hundred species. After his death, no special effort was made to preserve any of these introduced species that might have been left, and what proportion of these have survived until the present day is a question naturally of interest.

In August, 1916, upon the recommendation of Dr. C. F. Millspaugh of the Field Museum, Mr. O. E. Lansing, Jr. and myself were commissioned by the Field Museum to visit Athens, Illinois, and make a thorough reconnaissance of the flora in the immediate vicinity of the Hall estate. Our instructions were, not only to obtain a representative collection of plants from that vicinity but to look with particular care for all exotic species that might have survived from the days of Elihu Hall's activities.

On reaching Athens, August 25th, we were entertained at the Hall estate by Mr. Julian Hall and family and were shown the utmost courtesy and kindness in the prosecution of our work. Immediately upon our arrival, we had our attention drawn to a large, coarse composite that was very common along the pathway from the dooryard to the barnyard and near certain fences. Aside from this species, which later was determined by Dr. B. L. Robinson as *Siegesbeckia orientalis* L., no trace could be found of the many introductions that had been made years before.[2] Reference to the collections in the Field Museum Herbarium showed a specimen of precisely the same species, from the Bebb Herbarium. This plant had been collected by Elihu Hall, August 24, 1867, from among his plants under cultivation, and

[1] Concerning Elihu Hall's life and travels, see Bot. Gaz. VII. 126 (1882), *ibid.* IX. 59 (1884). Concerning his herbarium, see Bot. Gaz. LXII. 239 (1916).

[2] Except certain trees and perennial herbs, such as violets, that had been set out about the yard and had received some degree of protection.

likewise had been determined as *Siegesbeckia orientalis* L. Here, then, was a foreign (Asiatic) species that had persisted for from thirty-five years (i. e., since Elihu Hall's death) to nearly fifty years. But what to us seems far more worthy of record is the fact that none of the other introduced species were found to have maintained independently a foothold.

While the manuals do not list *Siegesbeckia orientalis* for the United States, Dr. Robinson states, in a letter accompanying his determination, that it has been found a few times before in America; that a form of it even was found "some years ago in a hilly bit of dump land within a quarter of a mile of the Gray Herbarium" at Cambridge, Massachusetts.

Chicago, Illinois.

THE STATUS OF GLYCERIA FERNALDII.

Harold St. John.

A detailed examination of a large amount of material has convinced the writer that *Glyceria pallida* (Torr.) Trin., var. *Fernaldii* Hitchc. has abundant and stable characters. It also departs from the species with which it has been associated in having a later flowering season and a different range. These matters are stated below in tabular form and should convince the reader, as they have the writer, that the plant should be considered as a species.

G. pallida (Torr.) Trin.	G. Fernaldii (Hitchc.).
Grain 1.5 mm. long	Grain 0.8 mm. long.
Anther cylindrical, 1 mm. long.	Anther globose, 0.2–0.5 mm. long.
Spikelets usually 4–7-flowered, 6–7 mm. long.	Spikelets usually 3–5-flowered, 4–5 mm. long.
Branches of panicle flexuous, ascending or somewhat divergent.	Lower branches of panicle strongly divergent or reflexed at maturity.
Leaves 5–20 cm. long, 2–8 mm. wide; lower sheaths usually divergent and free at summit.	Leaves 4–10 cm. long, 2–3 mm. wide; sheaths and ligules tightly clasping the stem.
Culm 3–10 dm. high.	Culm 2–4 dm. high.
Flowering in May and June.	Flowering in July and August.
Range from So. Me. to Va., and west to So. Ont., Mich. and Miss.	Range from Nfd. to Conn., and west to Minn.

Glyceria **Fernaldii** (Hitchc.), n. comb. *G. pallida* (Torr.) Trin., var. *Fernaldii* Hitchc., Rhodora, viii. 211 (1906).

The second glume of *G. Fernaldii* is 1–2 mm. in length, thus resembling that of *G. nervata* (Willd.) Trin., but the latter species has, as well as other characters, long cylindrical anthers.

Gray Herbarium.

TWO NEW MARITIME PLANTS OF NORTHEASTERN NORTH AMERICA.

M. L. Fernald.

Bidens Eatoni, var. **kennebecensis**, n. var., achaeniis exterioribus 8.8–9.8 mm. longis, interioribus 9.5–10.5 mm. longis.

Outer achenes 8.8–9.8 mm. long, the inner 9.5–10.5 mm. long.— Maine, tidal reaches of the lower Kennebec system: tidal mud-flats and swales by Cathance River, Bowdoinham, September 14 and 19, 1916, *Fernald & Long*, nos. 14,822 (type in Gray Herb.), 14,823, also in *Plantae Exsiccatae Grayanae*, no. 297; border of salt-marsh, Back River Creek, Woolwich, September 15, 1916, *Fernald & Long*, no. 14,824.

Exactly resembles *B. Eatoni* Fernald of the tidal flats of the lower Merrimac, but the Maine material of which several hundred individuals were collected has the achenes of the well developed heads consistently longer than in the plant of the lower Merrimac; the outer achenes of the latter being 6–7, the inner 7–9 mm. long.

Hudsonia ericoides L., forma **leucantha**, n. f., petalis albescentibus.

Petals whitish.— Prince Edward Island: sand hills near the sea, Bothwell, July 6, 1914, *Fernald & St. John* in *Plantae Exsiccatae Grayanae*, no. 241 (type in Gray Herb.).

Gray Herbarium.

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THE SARGASSO SEA.

FRANK S. COLLINS.

THERE seems to have always been some fascination about the Sargasso Sea, inducing people who had practically no knowledge of it to publish extensively in regard to it. The character of such publications ranges from Janvier's amusing and quite Munchausenish story [1] to Otto Kuntze's less interesting but no more trustworthy work [2] It has been described by older authors as a vast meadow, with an area larger than the whole of Germany, the dense vegetation seriously impeding the progress of vessels. "Crescit in omnibus fere rupibus aqua marina apertis circa Jamaicam, aliisque Americae pluribus, unde a fluctibus abruptum, magnamque partem maris Americani borealis implet, ut pratum viride diceret spectator remotus." [3] Kuntze and others consider it as consisting only of fragments of algae, torn from the shores of the West Indies, decaying and soon sinking. Most recent authors have held a more or less modified form of the latter theory, but Sauvageau [4] has shown its impossibility, and Börgesen [5] has brought together the more important data of previous authors, adding his own observations in several times crossing the Sargasso Sea, and reaching the conclusion that the plant in question, whatever its remote

[1] T. A. Janvier, In the Sargasso Sea. New York. 1898.

[2] Otto Kuntze, Revision von Sargassum und das sogenannte Sargasso-Meer. Engler's Bot. Jahrb., Vol. I, 1881.

[3] Linnaeus, Hortus Cliffortianus, p. 478, 1737.

[4] C. Sauvageau, Le Sargassum bacciferum, la mer des Sargasse et l'Océanographie. Comptes Rendus de la Soc. de Biologie, Vol. LXII, p. 1082, 1907.

[5] F. Börgesen, The species of Sargassum found along the shores of the Danish West Indies, with remarks upon the floating forms of the Sargasso Sea. Mindeskrift for Japetus Steenstrup, no. 32, 1914.

origin, is now a pelagic perennial, of continuous active growth, forming abundantly vesicles, leaves and branches, but as far as observed, no fructification; the lower part continually decaying and wearing away. Whenever this decay reaches the base of a branch, or a fork of the main axis, we have two individuals, in a loose sense of the word, in place of one. All this was set forth over sixty years ago by Harvey,[1] but his clear and full statement in this work, which is the basis of North American phycology, has been ignored by following writers, who substituted their own or others' guesses for Harvey's personal observations. Börgesen copies Harvey's remarks in full.

The floating species has passed under the name *Sargassum bacciferum* (Turner) Agardh [2] although both Turner and Agardh give as a synonym *Fucus natans* Linnaeus, Sp. Pl., Vol. II, p. 1160, 1753; Börgesen restores the correct form, *S. natans;* but as the earliest author he could find for this binomial was Robert Brown, Proc. Linn. Soc., Vol. II, p. 77, 1855, and Brown did not apply it to the present species, he uses the form *S. natans* (L.) only. M. A. Howe in a review of Börgensen's paper, Torreya, Vol. XV, p. 49, 1915, calls attention to the use of the binomial by J. Meyen in 1838 [3] which gives as the correct form, *S. natans* (L.) J. Meyen.

Börgesen has examined the Linnaean type, and it is the common narrow-leaved form of the Sargasso Sea; but among the floating vegetation he finds beside this, although in less quantity, another form, which in the paper referred to he calls *S. Hystrix* J. Ag., var. *fluitans* Börgs., but in a later paper [4] raises to specific rank as *S. fluitans* Börgs.

That the floating Sargassum must at some time have been derived from an attached plant is generally assumed, but apart from Börgesen's supposition that his new form was a variety of the attached and fruiting *S. Hystrix,* no one has published any serious attempt to determine the origin.

The coast of southern New England comes within the range of *Sargassum,* an attached species, *S. Filipendula* Ag., being rather common here. This is the *S. vulgare* of Harvey, Nereis Bor.-Am., part 1,

[1] W. H. Harvey, Nereis Boreali-Americana, part 1, p. 54, 1852.

[2] C. Agardh, Sp. Alg., Vol. I, p. 6, 1821; *Fucus bacciferus* Turner, Hist. Fuc., Vol. I, p. 103, Pl. XLVII, 1808.

[3] J. Meyen, Jahresbericht über die Resultate der Arbeiten in Felde der physiologischer Botanik v. d. Jahre 1837. Wiegmann's Archiv für Naturgeschichte, Vierter Jahrgang, Zweiter Band, Berlin, 1838.

[4] F. Börgesen, The marine algae of the Danish West Indies, part 2, Phaeophyceae. Dansk. Botanisk Arkiv, Vol. II, p. 157, 1914.

p. 59, as to New England localities; Hervey, Sea Mosses, p. 74; Farlow, Marine algae of New England, p. 103, and of various papers and lists, but not *S. vulgare* Agardh, as is pointed out by J. G. Agardh, Sp. Sarg. Austral., p. 120, 1889. *S. natans* is occasionally washed ashore from Vineyard Sound south; it follows the course of the Gulf Stream, and in times of strong, long-continued easterly winds, considerable quantities may be found from Gay Head to Nantucket Shoals. I have picked up a much battered fragment at Menauhant, in the eastern part of Falmouth, Massachusetts, and know of no record of its coming ashore farther north. *S. fluitans* is occasionally found with it. J. G. Agardh, Sp. Sarg. Austral., p. 106, writes, "radice instructam et fructiferam ad oras Americae foederatae lectam habeo, in rupibus extra New Foundland." I agree with Börgesen, Sp. Sarg., p. 12, "That the plant should have been found 'radice instructam' i. e. attached, near Newfoundland seems so unlikely that I deem it unworthy of consideration." Incidentally it is an interesting question geographically what part of the United States is on the rocks beyond Newfoundland. I have a specimen marked "In oceano prope Terre-Neuve fluitantem legit Lesquereux." A change of labels between this or another specimen of the same origin, and some attached plant, may have been the cause of Agardh's statement. Durant [1] notes finding it in New York Harbor, and includes it among the specimens accompanying his book. These specimens are of the typical form. It drifts ashore on the New Jersey coast,[2] and though there are practically no records of algae from Atlantic City, New Jersey to Charleston, South Carolina,[3] in all probability it grows more frequent as one goes south.

Perhaps the best place for the study of the pelagic *Sargassum* is the Bermuda Islands. On the voyage from New York one begins to see the floating patches and strips of the alga within 24 hours after leaving, and they continue in sight the rest of the voyage. They are everywhere in sight as one sails or rows about the islands, and windrows of the *Sargassum* may be found about high water mark on lee shores, like the windrows of Laminaria on the rocky shores of New England. The

[1] C. F. Durant, Algae and Corallines of the Bay and Harbor of New York. New York, 1850. For a full notice of this curious and long lost work, see Arthur Hollick. Proc. Staten Island Asso. A. & S., Vol. V, p. 85, 1915.

[2] I. C. Martindale, Marine algae of the New Jersey Coast, Mem. Torr. Bot. Club, Vol. I, p. 99, 1889.

[3] A list of the algae of Beaufort, North Carolina has been compiled by Dr. W. D. Hoyt, and will soon appear as a publication of the Bureau of Fisheries, Department of Commerce.

Sargassum is used in Bermuda for fertilizer as is *Laminaria* with us, and it is an important factor in agriculture. To one who has seen it only as scattered floating strips, the amount thrown ashore during a blow is astonishing. At the head of the narrow Inlet, near Flatts Village, I have known more than a hundred cartloads to be obtained from the mass brought in by one northwesterly gale. In my visits to Bermuda, April–May, 1912, and July–Sept., 1913, I was busy with other algae, and noticed only incidentally the floating forms; but one of the principal objects of my visit in Nov.–Dec., 1915, was to observe these floating forms. For this I had good facilities, thanks to Prof. E. L. Mark, Director, and Dr. W. J. Crozier, Resident Naturalist, of the Bermuda Biological Station. All facilities of the Station at Agar's Island were at my disposal. I lived at the island, collecting at its shores, and by excursions in motor boats in various directions.

As already noted, the floating material is sometimes in scattered irregular patches, but when there is any wind, it forms narrow strips, in the line of the direction of the wind. This is noted by Börgesen, Sp. Sarg., p. 12. "The Gulfweed is nearly always found in long narrow rows arranged in the direction of the wind, and at a right angle to the moving of the sea." The last phrase is rather ambiguous, possibly misleading. The strips are at right angles to the crests of the waves, but in the line of their motion, which is of course the same as that of the wind. He says further, "The Sargasso floats frequently so near the surface that tips of the leaves become emerged when moved by the sea." This is an exact description of the appearance in rough or even slightly moving water. In calm water one sees that a frond, as a whole, is of a slightly less specific gravity than the water; the stem lies just below the surface, and as the stiff leaves are radially arranged, those on one side project above the surface, from one to three cm., thickly set over the whole patch, much like the peduncles of some flowering plant, *Elodea* or *Potamogeton*. It is only in smooth water, and when the observer is nearly on a level with the water, that this is noticeable, but here it is quite striking. The color is quite light, yellowish olive; distinctly lighter than that of the attached species found in Bermuda. It is darker in the lower part of the individual. There are several attached species at Bermuda, *S. lendigerum* (L.) Agardh being the commonest, and found on exposed shores all around the islands. The same storms that bring ashore the pelagic forms, tear off fragments or even whole plants of the attached forms, which may

be found scattered through the mass, on or near the shore, but there is no danger of a careful observer making any mistake. The plants of *S. lendigerum* and the other attached species are darker in color, never project above the surface, and soon decay.

S. fluitans I found scattered among *S. natans* all about Bermuda; at a rough estimate about five per cent of the former, ninety-five per cent of the latter. They are quite distinct, and in the large quantity of both species I examined, I found no intermediate forms. Indeed I found that when I had shown a specimen of each to our boatman, who knew nothing whatever of algae, he was able to distinguish in the floating mass the less common *S. fluitans*, and bring in with his boat-hook as much as I wanted, without once making a mistake. *S. natans* and *S. fluitans*, collected together in lat. 25.58 north, long. 73.39 west, were distributed in Collins, Holden & Setchell, Phyc. Bor.-Am., the former under No. 833 as *S. bacciferum* forma *angustum* Collins, the latter under No. 832b as *S. bacciferum*. It is unfortunate that of the two forms then passing under the name of *S. bacciferum* the one corresponding to *S. fluitans* should have been taken as representing the type, and a form name given to the other, which we now know agrees with the Linnaean type.[1]

It is not impossible that *S. fluitans* has been derived from *S. Hystrix*, but if so, it must be a somewhat remote derivation, and the modifications have been sufficient to justify its rank as a distinct species. The derivation of *S. natans* is probably still more remote, the differentiation greater. Among the species known to me, the one that most resembles *S. natans* is one found at Bermuda resembling *S. linifolium* (Turn.) J. Ag., of the Mediterranean and the Adriatic. In the Bermuda plants so referred the leaves are very long and slender, as in *S. natans*, and the vesicles are not unlike. That this plant has been reported, as far as I know, from no other American station, is not of much importance if we consider the pelagic form to have arisen long ago, and not now to receive any accessions from attached plants. That no floating form occurs in the Mediterranean, where *S. linifolium* is common, may suggest that the Bermuda plant, though resembling the Mediterranean species, is distinct; indeed I am still in doubt after examining a large number of specimens of the former, and comparing

[1] By a misprint in the label of No. 833, the latitude is given 55.58. It is however, stated that the material was collected at the same time and place as that of No. 832, which has the correct figures of latitude, 25.58.

them with authentic specimens of the latter. The Bermuda plant grows always in sheltered places, and is rarely found floating even after severe storms; *S. lendigerum*, a very different species, inhabits exposed shores, and as already noted, is frequently mixed with *S. natans* after storms. In my last trip to Bermuda I collected a considerable quantity of each of the four species spoken of above, and attempted to rough-dry it for later study and mounting, but owing to unfavorable weather during the last few days of my stay, I had to pack up quite an amount still moist. It was more than ten days before it was unpacked, and I found that while the three other species were in good condition, all of the *linifolium* form was decayed and worthless. How much weight should be given to these considerations as against the origin of *S. natans* from this species it is hard to say; it may be that the pelagic condition is sufficient to account for the differences.

In considering the question of the antiquity of this pelagic form, it is interesting to note that at present a considerable fauna is associated with the Sargasso Sea, quite distinct from that found on attached *Sargassum*. I have seen statements that at least fifty species of animals have been recorded as characteristic of it, many of them seldom found elsewhere. This association is so well known to the collectors at the Wood's Hole Biological Laboratory, that when the gulfweed is reported as coming near land, they go out to obtain from it a number of species that they keep in stock, but never find otherwise. Among these are the attached mollusk, *Litiopa bombix*, some free amphipods, two crabs, *Planes minutus* and *Partunus Sayi*, and most interesting of all, the fish *Pterophryne histrio*. It seems to me that the specialization of this fish to its habitat in the *Sargassum* is a strong evidence of the antiquity of the latter in its present condition. The markings on the fish closely simulate the leaves of the plant, and it has several outgrowths, exactly like battered and bristly stalks of the plant, and except for protection by resemblance, of no use that we can see to the fish. It is practically impossible to distinguish the fish from the floating alga in which it lives. "The marvellous and undoubtedly protective coloration and configuration of this fish render it one of the most striking objects which appear on the coast."[1]

The animals mentioned are displayed in the public collections of the Boston Society of Natural History as "Sargassum Crabs" etc. There

[1] F. B. Sumner in A biological survey of the waters of Woods Hole and vicinity. Bull. Bureau Fisheries, Vol. XXXI, part 2, p. 774, 1913.

is a colored plate of the *Pterophryne* in G. B. Shattuck, The Bahama Islands, Pl. LV, 1905. In this the fish is painted in colors brighter than in nature, the gulfweed in duller; but even so, the mimicry is striking.

Is there reason to suppose that the Sargasso Sea contains any other species of algae? I think that there is evidence that *Ascophyllum nodosum* (L.) Le Jolis, if not actually adapted to a pelagic life, shows a tendency towards it. While never found attached at Bermuda, it is occasionally found among floating *Sargassum*, indeed one is almost sure to find it by going carefully over any large mass of the latter. It is always without basal disk, and the lower part is in the same worn condition shown by the *Sargassum*. In one instance the lower end of the frond showed a cup-shaped cavity, caused by internal decay, and in this were three individuals of the barnacle, *Lepas anatifera*, an organism never recorded on *Ascophyllum* under normal conditions, and of a size indicating an age of not less than two weeks. This indicates only the shortest length possible for its floating condition. It is a common shore plant from the arctic regions to New Jersey on the American coast, to the Bay of Biscay on the European. It seems less likely that it could come from the former, crossing the rapid current of the gulfstream, than that it should come from Europe, from which a westerly current passes just south of Bermuda. As to its occurrence with *Sargassum* elsewhere, Bouvier[1] says, "Ça et la, parmi les Sargasses, on rencontre quelques fragments de *Fucus nodosus*, arrachés certainement aux rivages des Canaries, de Madère ou des Açores." To be sure, Sauvageau, *Sargassum bacciferum*, p. 1083, points out that the *Fucus* (*Ascophyllum*) has never been reported growing at the Canaries, Madeira or the Azores; but Bouvier's erroneous assumption does not invalidate his record of the occurrence of the plant. Börgesen writes me "Professor Gran has most kindly communicated me that *Ascophyllum* was found in the northern part of the Sargasso Sea, and rather abundant." It seems probable then that *Ascophyllum nodosum* occurs, though in quite small quantity relatively, throughout the Sargasso Sea. But in one important respect it differs from the species of *Sargassum;* it is frequently found in fruit, sometimes luxuriantly. If, as is now generally believed, fructification in algae is a response to changed conditions, usually condi-

[1] Bouvier, Bull. del' Institut Oceanographique, 1907, No. 93, p. 35.

tions unfavorable to vegetative growth, its absence in the pelagic *Sargassum* is probably due to the uniformity of conditions and steady vegetative growth; the *Ascophyllum* has at any rate not reached that state.

The only other plant to be considered in this connection is a *Cystoseira* resembling *C. crinita* Bory, a number of specimens of which were found in a lot of *S. natans*, collected in the North Atlantic by Professor F. H. Storer, in August, 1854, on a voyage in a clipper ship from Canton to New York.[1] The Cystoseiras are specially characteristic of the Mediterranean, but extend on the Atlantic both north and south of the Straits of Gibraltar. Sauvageau,[2] gives 33 species as occurring within this range, and considers the floating plant, while nearest to *C. crinata*, not exactly identical. The only American species of the genus is *C. Myrica* Bory, a very different plant.

In conclusion:—The predominant species of the Sargasso Sea is *S. natans* (L.) J. Meyen; through long pelagic existence so differentiated from its original attached ancestor that the latter cannot now be identified; of active vegetative growth but propagating only by fragmentation, having associated with it a much specialized fauna. The Sargassum exists not as a continuous mass, but as scattered patches through an area in the North Atlantic bounded by the Gulf Stream, and its subsidiaries reaching the coast of Europe, thence south and again west to the point of origin in the Gulf of Mexico; fragments may be driven by high winds to the shores of New England and Northern Europe. *S. fluitans* Börgs. accompanies it, but in less quantity, less differentiated, probably more recently, from its attached ancestor, which may be *S. Hystrix* J. Ag. Of equal distribution but in relatively minute proportion, *Ascophyllum nodosum* (L.) Le Jolis is practically undifferentiated from the attached plant, but though floating and fruiting freely for weeks, probably for months, cannot be considered persistent in the pelagic condition. Finally there is a sterile *Cystoseira*, resembling *C. crinita* Bory, found once only, its status therefore uncertain.

North Eastham, Massachusetts.

[1] For details of this collection, as also for many interesting remarks on pelagic Sargassum, see W. G. Farlow, The vegetation of the Sargasso Sea. Proc. Amer. Phil. Soc., Vol. LIII, p. 257, 1914.

[2] C. Sauvageau, À propos des Cystoseira de Banyuls et de Guéthary. Bull. Sta. Biol. Arcachon, 14e année, 1912.

THE IDENTITY OF CIRCAEA CANADENSIS AND C. INTERMEDIA.

M. L. Fernald.

In 1915 the present writer pointed out [1] that the Alleghanian plant which has long passed in America as *Circaea lutetiana* L. is not that species, but is rather *C. latifolia* Hill, Brit. Herb. 138 (1756). At that time he did not enter into a discussion of the other species of *Circaea* in eastern America, wishing to make further studies of the plants before pronouncing upon their identities.

Besides the common *C. latifolia* of deciduous woods from western New Brunswick westward and southward, we have the more northern *C. alpina* L. which differs in very many characters from *C. latifolia*, and a third plant somewhat intermediate both in size and technical characters between the two, the plant which is passing in our manuals as *C. intermedia* Ehrh. Beitr. iv. 42 (1789). That this third plant is identical with the European *C. intermedia* there seems little question, several sheets of European specimens showing no characters by which the American and European material can be separated. This plant, which is related to *C. latifolia* and to *C. lutetiana* in having the fruit 2-celled (as contrasted with the 1-celled fruit of *C. alpina*), and the root-stock slender (as contrasted with the tuberous-thickened root-stock of *C. alpina*) and comparatively large flowers, differs at the same time from *C. latifolia* in several definite characters. Its stems are comparatively weak and succulent; the leaves pale green and flaccid, as in *C. alpina*, broadly ovate and usually cordate, with very prominent sharp dentation; the petiole channeled or distinctly margined; the fruiting pedicels merely spreading or only slightly deflexed; the disk inconspicuous and not prolonged (as contrasted with the definitely prolonged cup-like disk of *C. latifolia*); and the mature fruit 1.5–3 mm. thick, including the long soft trichomes, and not corrugated (as contrasted with the strongly corrugated fruits of *C. latifolia* which are 3.5–5 mm. thick, including the strongly hooked bristles).

That the three species are perfectly distinct there can be no question, although in Europe *C. intermedia* has sometimes been considered a

[1] Rhodora, xvii. 222 (1915).

possible hybrid between *C. alpina* and *C. lutetiana*. In eastern America the range of our three species does not coincide and there is little to suggest hybrid characters. *C. latifolia* is an essentially southern species, reaching its northeastern limit in southern and eastern Ontario, southern Quebec, southern Coos County, New Hampshire, central Maine, and southwestern New Brunswick. *C. alpina* is a boreal species, extending from southern Labrador to Alaska and southward across northern New England and northern New York, becoming local in southern New England and along the mountains to Georgia, and westward in the Great Lake region, etc. *C. intermedia*, although credited with a broad range in the 7th edition of Gray's Manual, proves to be a rather local plant, characteristic of rich alluvial woods from Bonaventure County to Lake St. John, Quebec, and southward to Nova Scotia, Cumberland County, Maine, Cheshire County, New Hampshire, and Berkshire County, Massachusetts. In the greater portion of its range *C. intermedia* is not coincident with both *C. alpina* and *C. latifolia* and it seems to be unquestionably a true species which combines some of the characters of the other two. That the plant should not, however, be called *C. intermedia* becomes apparent upon examining the plate of *Circaea* in Hill's Vegetable System, x. t. 21 (1765); for there the left hand figure on the plate is a beautiful representation of the Canadian and New England plant which is identified with *C. intermedia*, illustrated as a new species, *C. canadensis*, and given the very distinctive English name "Toothed Enchanters Nightshade" on account of the salient teeth of the broadly cordate-ovate leaves. Not only in its habit and foliage does the plate clearly show the American *C. intermedia* but the flowers are of the correct size and the fruiting pedicels merely spreading.

This species, *C. canadensis* Hill, was described with "toothed" leaves, a "native of North America; a Plant of 10 inches high, flowering in August. The Stalk is green; the Flowers are white, with a dash of crimson." The crimson dash referred to comes from the crimson calyx which is ordinarily strongly contrasted in *C. canadensis* (*C. intermedia*) with the white petals. *C. canadensis* Hill (1765) thus antedates by 24 years *C. intermedia* Ehrh. (1789), and under the earlier name the species should be known. Whether Hill's *C. canadensis* was supposed by him to have anything to do with the *C. canadensis, latifolia, flore albo* of Tournefort [1] which was the basis for the Linnean

[1] Tourn. Inst. 301 (1700).

C. lutetiana, β. canadensis[1] is not clear for he made no reference to earlier publications; but since Hill's definite use of the name was apparently the first post-Linnean use of it as a specific name there is no reason why it should not stand, regardless of what the pre-Linnean plant and the Linnean variety, to which Hill did not refer, may have been.

In studying the genus *Circaea* in eastern America the writer has found the characters separating our species much more definite than are generally ascribed to them, and it may be of use to others to have the following synopsis:

A. Stem firm, 0.2–1 m. high: leaves dark-green above, rather firm, oblong-ovate, shallowly undulate-dentate, rounded or merely subcordate at base, on subterete petioles: leading racemes becoming 0.7–2.5 dm. long in fruit: mature pedicels strongly reflexed: calyx-lobes 1.8–2.6 mm. broad: disk cup-like, prolonged about 0.5 mm. above the perianth: anthers 0.7–1 mm. long: stigma subcapitate, shallowly 2-lobed: mature fruit compressed-pyriform, with 3–5 corrugations on each face, including the strong hooked bristles 3.5–5 mm. thick.....1. *C. latifolia.*

A. Stems rather weak and succulent, 0.4–4.5 dm. high: leaves pale-green, flaccid, ovate, coarsely sharp-dentate, cordate or subcordate (rarely only rounded) at base, on channeled or margined petioles: leading racemes becoming 0.15–1 dm. long in fruit: mature pedicels spreading or only slightly reflexed: calyx-lobes 0.8–1.7 mm. broad: disk inconspicuous, rarely at all prolonged: anthers 0.2–0.8 mm. long: stigma deeply cleft: mature fruit club-shaped to slender-pyriform, not corrugated, including the soft hairs 1–3 mm. thick. B

B. Root-stock slender, scarcely tuberous-thickened: calyx-lobes 1.2–1.7 mm. broad: petals 2.3–3.5 mm. long: anthers 0.5–0.8 mm. long: fruit unequally 2-celled, including the long trichomes 1.5–3 mm. thick.....2. *C. canadensis.*

B. Root-stock tuberous-thickened: calyx-lobes 0.8–1.2 mm. broad: petals 1.2–2.5 (rarely 3) mm. long: anthers 0.2–0.3 mm. long: fruit 1-celled, including the very short trichomes 1–1.5 mm. thick. 3. *C. alpina.*

C. LATIFOLIA Hill, Brit. Herb. 138 (1756); Fernald, RHODORA, xvii. 223 (1915). *C. lutetiana* of American authors, not L. *C. lutetiana*, var. *canadensis* of early American authors, perhaps of L. *C. lutetiana*, var. *quadrisulcata* Maxim. Prim. Fl. Amur. 106 (1859). *C. quadrisulcata* (Maxim.) Franchet & Savatier, Enum. Pl. Jap. i. 169 (1875). Rich, chiefly deciduous, woods, thickets and ravines, St. John valley, southwestern New Brunswick, and central Maine to Minnesota, south to North Carolina, Tennessee and Oklahoma; also eastern Asia.

C. CANADENSIS Hill, Veg. Syst. x. t. 21, fig. 2 (1765). *C. intermedia* Ehrh. Beitr. iv. 42 (1789). Rich low woods, oftenest in alluvium, Bonaventure County to Lake St. John, Quebec, south to Nova Scotia, Cumberland County, Maine, Cheshire County, New Hampshire, and Berkshire County, Massachusetts; also in Europe.

[1] L., Sp. Pl. i. 9 (1753).

C. ALPINA L. Sp. Pl. i. 9 (1753). Cool woods, wet mossy openings, margins of streams, etc., southern Labrador to James Bay and northwestward to Alaska, southward through Newfoundland, eastern Canada, northern New England, northern New York, etc., and more locally to southern New England, Georgia, the Great Lake states, So. Dakota, etc.; also Eurasia.

GRAY HERBARIUM.

IS ASTER TARDIFLORUS A HYBRID?

ARTHUR STANLEY PEASE.

DURING the late summer of 1916, in the towns of Randolph, Gorham, and Jefferson, New Hampshire, I was on more than half-a-dozen occasions impressed by a blue-flowered *Aster* which I could not at once name. Its inflorescence at times suggested *A. cordifolius*, but the leaves were not cordate; the involucre was nearer to that of *A. puniceus*, but again the shape of the leaves failed to match. It was worthy of remark that the plant was in each instance solitary or appearing in but two or three specimens, while in each case *A. puniceus* and *A. cordifolius* were observed, usually in some abundance, near by. These facts led to the suspicion that one of the numerous hybrids of the genus had been found, and that *A. puniceus* and *A. cordifolius*, the two commonest and most generally distributed blue-flowered *Asters* of the region were its parents.[1]

But my interest was further aroused when the plants in question proved, upon analysis, to match exactly the description in Gray's Manual of *Aster tardiflorus* L., and when subsequent comparison at the Gray Herbarium confirmed this diagnosis. The query, then, naturally arises whether *A. tardiflorus* is not a hybrid. Its intermediate characters can be more clearly indicated by the following résumé (compiled from the Manual descriptions of the three species I have mentioned).[2]

[1] The only other blue-flowered Asters known in the region are *A. macrophyllus* L., *A. radula* Ait., *A. foliaceus* Lindl., and *A. novi-belgii* L. The first two of these bear no resemblance to the plants in question, and the last two are of very local distribution and unknown in the neighborhood of most of the stations for the supposed hybrid.

[2] Points not noted in the Manual are enclosed in brackets.

i. Color of Stem.	*cordifolius* [green or purple.] *tardiflorus* [green or purple.] *puniceus* usually purple below.
ii. Pubescence of Stem.	*cordifolius* nearly glabrous (but var. *Furbishiae* Fernald densely villous). *tardiflorus* glabrous or subpubescent (but var. *vestitus* Fernald densely villous). *puniceus* rough hairy in lines [but a variety from northern Maine densely villous].
iii. Shape of Leaves.	*cordifolius* cordate, the lower on slender and naked ciliate petioles. *tardiflorus* ovate- or oblong-lanceolate, narrowed at both ends, the lower to a winged [often ciliate] petiole, not auriculate or only obscurely so. *puniceus* oblong-lanceolate or lanceolate, not narrowed or but slightly so to the auricled base.
iv. Serration	All three have leaves sharply serrate in the middle.
v. Inflorescence.	In all three paniculate.
vi. Height of Involucre.	*cordifolius* 4–6 mm. *tardiflorus* 5–7 mm. *puniceus* 7–12 mm.
vii. Involucral Bracts.	*cordifolius* appressed, tipped with short green points, obtuse or acutish [ca. 3-seriate]. *tardiflorus* lax, linear or linear-subulate, subequal or 2–3-seriate. *puniceus* loose, thin, narrowly linear, attenuate, subequal, in about 2 rows, the outer sometimes foliaceous.
viii. Color of Rays.	*cordifolius* pale blue or nearly white. *tardiflorus* light blue. *puniceus* lilac-blue to white.
ix. Length of Rays.	*cordifolius* [rather short, for the genus.] *tardiflorus* [short to medium.] *puniceus* long and showy.

x. Date of Flowering. All three: Aug.–Oct.

xi. Range. { *cordifolius* E. Que.— Ia.— Ga.— Mo.
tardiflorus N. B. — Pa.
puniceus Nfd.— Man.— Ga.

To one who examines these points it will, I think, appear that a plant more exactly intermediate between two quite distinct species could hardly be found. And this would be even more apparent to one who should examine in actual specimens the shape of the leaf of *A. tardiflorus*, which is the only natural intermediate that one could expect between a cordate petioled leaf and an oblong-lanceolate auricled one. The supposed parent-species are abundant northeastward, hence it is hardly surprising that this hybrid should have appeared at various places. Material at the Gray Herbarium, however, does not indicate commonness anywhere save perhaps in the vicinity of Lisbon, New Hampshire, where it was rather often collected by the late Edwin Faxon. But, as the last summer's experience of the writer shows, when once one has learned what this plant looks like he may see it in a considerable number of places without finding anywhere more than one or two plants in a station, so that the numerous collections by Mr. Faxon need not indicate a degree of commonness that might lead one to regard *Aster tardiflorus* as an established and stable species.

The writer would be glad to learn of the observations of others in regard to this somewhat infrequently studied plant. Perhaps someone with facilities for the work might undertake to produce an artificial hybrid for comparison with *A. tardiflorus*.

Cambridge, Massachusetts.

A NEW CARDAMINE FROM SOUTHERN MAINE.

M. L. Fernald.

Cardamine **Longii**, n. sp. Differt a *C. pensylvanica:* foliis simplicibus reniformibus vel suborbicularibus 0.5–1.5 cm. longis petiolatis basi cordatis vel rotundatis, rarissime inferioribus cum 2 foliolis lateralibus parvis; floribus apetalis 0.7–1.2 mm. longis subsessilibus: siliquis subsessilibus patentibus vel adscendentibus subulatis 5–8 mm. longis in stylum 0.5–1 mm. longum attenuatis; seminibus ovatis flavis brunneo-marginatis 1.2 mm. longis 0.8 mm. latis.

Differing from *C. pensylvanica* in having the leaves simple, reniform or suborbicular, 0.5–1.5 cm. long, petioled, cordate or rounded at base, very rarely the lower with 2 small lateral leaflets: flowers apetalous, 0.7–1.2 mm. long, subsessile: siliques subsessile, spreading or ascending, subulate, 5–8 mm. long, attenuate to a style 0.5–1 mm. long: seeds ovate, yellow, brown-margined, 1.2 mm. long, 0.8 mm. wide.— Maine: shaded rock-pockets and crevices covered at high tide, Cathance River, Bowdoinham, September 14 and 19, 1916, *Fernald & Long,* no. 13,698 (type in Gray Herb.); also on tidal mudflats of Cathance River, Bowdoinham, no. 13,697.

A remarkable little plant with which it is a pleasure to associate the name of Mr. Bayard Long, the writer's companion on many collecting trips. Differing at once from *C. pensylvanica* Muhl., *C. hirsuta* L., *C. flexuosa* With., *C. parviflora* L. and their allies in its usually entire rounded or cordate leaves, its minute apetalous flowers and its very short almost sessile capsules. In the type locality the plant was in the shelter of an overhanging ledge and the carpet of plants so strongly suggested *Chrysosplenium* that we at first thought we had found a strange species of that genus.

On the tidal flats and rock-pockets along Cathance River, *Cardamine Longii* is associated with a remarkable colony of estuarine species: *Sagittaria heterophylla* Pursh (first definite station in Maine); *Eleocharis diandra* C. Wright; *Scirpus Smithii* Gray, var. *setosus* Fernald; *S. fluviatilis* (Torr.) Gray; *Eriocaulon Parkeri* Robinson (found also on the flats of other tributaries of the Kennebec and on the tidal reaches of the Penobscot); *Nuphar advena* (Ait.) Ait. f. (the first known station for true *N. advena* east of New York); *Tillaea aquatica* L.; *Elatine americana* (Pursh) Arn. (see Rhodora, xix. 10–13); *Samolus floribundus* HBK. (here as on the lower Penobscot delighting

in cool sheltered rock-pockets, thus suggesting *Primula farinosa* of more northern regions); *Bidens colpophila* Fernald & St. John; and *B. Eatoni* Fernald, var. *kennebecensis* Fernald (see RHODORA, xix. 76).

From this list of some of the characteristic associates of *C. Longii* at the type locality it is evident not only that the plant has associated itself with a peculiarly local series of estuary species, but that search is likely to reveal it at other estuaries where some of these species occur.

GRAY HERBARIUM.

NOTE ON NUPHAR.— In RHODORA xviii. 90, 1916, the Local Flora Committee reported *Nymphaea advena* Ait. and *N. variegata* (Engelm.) G. S. Miller as both occurring within the Boston district. The differences between these species have been clearly brought out by Miller & Standley (Cont. U. S. National Herb. xvi. 3) and further discussed by Fernald & St. John (RHODORA xvi. 137–141, 1914). In the latter article the validity of the specific name *variegata* is proved.

The consideration of these descriptions shows true *N. advena* to be an estuarine plant. It has erect leaves usually borne *above* the surface of the water, with lobes mostly triangular, and diverging about 80°. The leaves are 13 to 33 cm. long and 14 to 25 cm. broad; sinus 4.5 to 10 cm. deep. An examination of the specimens in the Club Herbarium from the Boston District shows none of this plant, while *N. variegata* is common.

Prof. Conard's careful researches on nomenclature (RHODORA xviii. 161–4) show the validity of the generic name *Nuphar* for these yellow cow-lilies. The plant found in our region should therefore be called *Nuphar variegatum* Engelm.— CLARENCE H. KNOWLTON, for the Local Flora Committee.

The twenty-third annual FIELD MEETING OF THE JOSSELYN BOTANICAL SOCIETY OF MAINE will be held at Greenville Junction, July 31, 1917, with headquarters at the Piscataquis Exchange. Announcements will be sent to members and to others on request two weeks previous to the meeting. — DANA W. FELLOWS, Secretary, Portland, Maine.

Vol. 19, no. 220, including pages 61 to 76 and a portrait plate, was issued 17 April, 1917.

Rhodora

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A NEW SPECIES OF ERAGROSTIS OF THE OLD WORLD AND NORTH AMERICA.

K. M. Wiegand.

While collecting in the railroad yards at Ithaca New York during the summer of 1914 the writer noticed that the abundant material of *Eragrostis pilosa* growing between the ties was not all uniform. A casual examination showed that two strains, differing much in appearance, existed side by side. Each strain was abundant, but the coarser strain predominated in the proportion, roughly, of two to one. The material collected at this time was laid aside and did not come to notice again until recently. A more careful examination now shows that the two strains differ materially in several respects.

After the resurrection of the material, it was taken, along with other problems, to the Gray Herbarium for study. There it was soon apparent that the coarser of the two strains was the common and widely distributed *E. pilosa* of Europe and America. After a long search, four specimens were found which matched the finer strain. Three of these were from Europe and one only from America. All three of the European specimens were indicated as weeds in gardens or between paving stones, one coming from Warsaw, one from Karlsruhe and the third from Berlin. The American specimen was collected by M. L. Fernald along a roadside at Alstead, New Hampshire. Later, the Herbarium of the New York Botanical Garden was visited, and a search there made for the plant. Three more specimens were found; one from Japan, one from Mickleton, New Jersey, and the other from Lancaster, Pennsylvania. These few specimens, it will be seen, indicate a rather remarkable distribution, as the plant must

be rare and local everywhere. Also, it has never as yet been found in the indigenous state, but always as a weed; and its home country is not yet known. At present it is a veritable "man without a country," and we shall look with interest for the discovery of its native haunts.

All of the specimens mentioned were extremely uniform, and matched our Ithaca specimen perfectly. The Karlsruhe specimen bore the name *E. pilosa* var. *condensata* Hackel, and was a portion of the material on which this variety was based, it being a part of the original material distributed by Kneucker. Our plant is therefore the *E. pilosa* var. *condensata* of Hackel. However, the study of all of the material mentioned has brought to light several other good distinguishing characters besides those mentioned by Hackel, so that in the judgment of the writer the plant is really a very good species, and should be recognized as such. The name *condensata* is in use, however, for another species, and therefore cannot be used. This being so, the name *peregrina* may very appropriately be substituted.

This plant is not to be included in the question of the status of *E. Purshii*. *E. pilosa* and *E. Purshii* are extremely close in relationship, and there can be a legitimate doubt as to whether both are good species, but our plant differs in several important respects from each.

Of our plant Hackel says, translated: — "The present plant is to be distinguished from the typical form by: solitary branches of the panicle without hairs in their axils (which however are sometimes lacking in the typical form), the branches of the panicle are spikelet-bearing to the base so that the panicle appears much denser. The spikelets are short-pedicelled (the next to the last on each branch possesses a pedicel about 1 mm. long). In the typical form the branches of the panicle are in 2's or 4's and branched from the one-third or one-half point upward, and loosely provided with spikelets whose pedicels are at least 2 mm. long. The plant is closely related to the *E. Purshii* (*caroliniana*) but is distinguished from it by the absence of conspicuous lateral nerves on the flowering glume."

The writer finds that the differences noted by Hackel hold fairly well for all the other specimens examined. The branches of the panicle however are sometimes solitary in smaller forms of *E. pilosa* (including *E. Purshii*). Also, in smaller plants of the latter species the spikelets extend sometimes far toward the base of the branches. The spikelets are in the main shorter-pedicelled than in *E. pilosa*.

The lateral nerves of the flowering glumes are always inconspicuous, but there are occasional specimens of *E. pilosa* in which they are equally indistinct. As an additional character may be mentioned the smooth empty glumes, which in *E. pilosa* are usually, but not always, scabrous on the keel. The florets are also somewhat smaller. The two most constant differences, however, are the denser panicle, which resembles that of *Agrostis alba* or *Panicum agrostoides*, and especially the absence of the long pilose hairs on the auricles of the sheath. The plant is much more constant in its characters than is *E. pilosa*. It can be readily recognized by its general appearance.

The following is a more detailed description than is given by Hackel:

ERAGROSTIS **peregrina**, sp. nov. (*E. pilosa* var. *condensata* Hackel, Allgem. Bot. Zeitschr. vii. 13 (1901), non *E. condensata* Steud.) Annua; culmis pluribus ascendentibus vel erectis glabris basi aliquid geniculatis; foliis 2–6 cm. longis raro longioribus 1–2.5 mm. latis glabris, ligula e pilis tenuioribus 0.5 mm. longis vel brevioribus formata, vaginis aliter summo nudis; panicula subdensa 5–12 cm. longa 2.5–4 cm. diametro oblonga, ramis plerumque solitariis, longioribus 1–4 plerumque 2–3 cm. longis angulo 45° patentibus densius spiculiferis fere ad basim; axillis glabris; spiculis 6–10-floris 3–5 mm. longis 1–2 mm. latis in pedicellis brevissimis 0.5–2.5 mm. longis, glumis vacuis parvis lanceolato-ovatis acutissimis hyalinis inaequalibus, superiore glumis florentibus duplo breviore, carina non scabra; gluma florente (lemmate) aliquanto divaricata ovata acuta 1.4 mm. longa tenui et membranacea infra viride supra castaneo-rubra ad apicem palidiore, carina apicem versus scabra, nervis lateralibus indistinctis, caryopsibus 3–6 mm. longis ovali-oblongis sucino-fuscis.

Annual; culms several, somewhat geniculate at the base, ascending or erect, glabrous: leaves 2.6 cm. long, rarely longer, 1–2.5 mm. wide, glabrous; ligule of fine hairs, 0.5 mm. long or less; sheaths otherwise naked at the summit; panicle rather dense, 5–12 cm. long, 2.5–4 cm. broad, oblong; branches mostly solitary, the longer 1–4 (mostly 2–3) cm. long, spreading at an angle of 45°, rather densely spikelet-bearing to near the base; the axils glabrous: spikelets 6–10-flowered 3–5 mm. long, 1–2 mm. wide, on very short pedicels 0.5–2.5 mm. long; empty glumes small, lance-ovate, very acute, hyaline, unequal, the upper about one half the length of the flowering glume; keel not scabrous; flowering glume (lemma) somewhat spreading, ovate, acute, 1.4 mm. long, thin and membraneous, greenish below, chestnut-red above, the tip paler; keel scabrous toward the apex; lateral nerves indistinct; caryopsis 0.5–0.6 mm. long, oval-oblong, amber-brown.

Specimens examined: GERMANY: "Auf Gartenland im Grossherzoglichen Hofgarten, Karlsruhe, seit langen Jahren äusserst lästiges und schwer zu beseitigendes Umkraut: sandiger humus.

Begleitpflanzen Euphorbia polygonifolia Jacq. Ca. 117 m. ü. d. M: 17 July, 1900," *A. Kneucker:* Gramineae exsiccatae, no. 115. Type collection of *E. pilosa* var. *condensata* Hackel; Botanic Garden, Berlin, Aug. 2, 1877, *P. Magnus.* POLAND: Between paving stones, escaped, Warsaw, Sept., 1885, *Przybulski.* JAPAN: Plants of the Liu Kiu Islands, collected for L. Boehmer & Co. in 1904, no. 174. NEW HAMPSHIRE: Cheshire County; dry roadside, Alstead, Aug. 2, 1900, *M. L. Fernald*, no. 360. NEW JERSEY: Gloucester County; Mickleton, Aug., 1887, *B. Heritage.* PENNSYLVANIA: Lancaster County; Vicinity of Lancaster, Sept., 1889, *J. K. Small.* NEW YORK: Tompkins County; in gravel and cinders between railroad ties, Ithaca, Aug. 12, 1914, *K. M. Wiegand*, no. 1669.

CORNELL UNIVERSITY, Ithaca, New York.

RANGE OF CAREX NOVAE-ANGLIAE EXTENDED INTO PENNSYLVANIA.

BAYARD LONG.

SINCE the appearance of Prof. T. C. Porter's estimable *Flora of Pennsylvania* in 1903, discoveries of indigenous species heretofore unknown in the region have not been so overwhelmingly numerous that they are without a certain interest. Some index of the almost exhaustive exploration which Prof. Porter and his associates succeeded in achieving over an area of really very considerable size and diversity is shown by the fact that only about one in ten of the additions in recent years is an indigenous species which was well known in Porter's day. For it will be remembered that in the numerical count of species there are two main sources of so-called "additions" to the flora of any well known area: new introductions and species due to work of more recent revision and segregation. In these two categories are unquestionably included the great majority of species (now known to occur in the state) which are not recognized in Porter's *Flora.*

As a further suggestion of the completeness of Porter's Pennsylvania collection may be noted the fact that it contains an excellent representation of species recently described or ones only lately recognized as elements of our flora. Thus, for example, there is ample material from the state of *Echinochloa muricata, Muhlenbergia foliosa,*

and *Carex incomperta*. There is a representation of *Carex laevivaginata*, *C. projecta*, and *Dioscorea glauca*. Even some very rare Pennsylvania plants had been obtained in several cases. Of that interesting sedge known as *Rynchospora Smallii* Britton, thus far found at only four localities in the state, the Pennsylvania assignment with the original description is based upon material collected by Porter in Chester County — a fact not very commonly known.

It may not even be asserted with confidence that all of the additional native species, recognized in Porter's time but not recorded by him from Pennsylvania, were entirely unknown to him from this area. For, although he was one of the most acute and discriminating botanists of his day, like any other student he was not completely clear on every critical group. It is found, as a case in point, that although *Carex Bicknellii*, as a name, was well known to him and that he had excellent Pennsylvania material of it in his herbarium, it was confused with other allies of *C. straminea* in his *Flora*. But it is fairly certain that among real additions to the flora of the state, quite unknown to Porter, may be numbered such plants as *Sporobolus uniflorus* [1] and *Rynchospora fusca* [1] (discovered by Dr. Witmer Stone at Lake Bella Sylva in Sullivan County, August 29, 1903), *Eleocharis Robbinsii* [1] (found by the late Charles S. Williamson, also at Lake Bella Sylva, August 18, 1908), *Allium sibiricum* [2] (apparently first detected by Mr. Percy Wilson on the Palisades of the Delaware River, in Pike County, opposite Sparrowbush, New York, May 30, 1902), *Fimbristylis puberula* [3] (collected by the late Joel J. Carter, in his energetic explorations in Lancaster County, near Eldora Station, July 27, 1910). To this group may be added *Carex novae-angliae* upon the basis of several well authenticated stations in different portions of Pennsylvania.

For a Philadelphian, some of my most pleasant recollections, associated with a delightful week in June, 1907, on the Pocono Plateau, center about the finding of Labrador Tea, Twin-flower, Creeping Snowberry, Small Cranberry, and the like, but they might well be coupled with a much more important discovery — had it been recognized at the time. With Porter's *Flora of Pennsylvania* as a guide I

[1] These species are incidentally recorded, without comment, in the introductory matter of Stone's *The Plants of Southern New Jersey* (Ann. Rep. N. J. State Mus., 1910, 110).

[2] Taylor, Fl. Vic. N. Y. 233 (1915).

[3] Small and Carter, Fl. Lancaster Co. 45 (1913).

had found and distinguished *Carex oligosperma* at Long Pond, had become acquainted with *Carex filiformis* and *C. utriculata*, as well as a number of other northern species of interest in the state, but even with a youthful enthusiasm I had been unable to fathom with more than a modicum of success the intricacies of the more critical groups in *Carex*. In the press of other interests the unnamed Carices from this Pocono trip lay neglected for a long time — during which interval some acquaintance was made with the *Montanae*, among other groups. And when these plants came to be examined again it was with considerable interest that, it was discovered that *Carex novae-angliae* had been collected at Pocono Lake.

With the thought of other possible material from Pennsylvania, the Academy collection was thoroughly overhauled. Careful inspection, in a large herbarium, of the material of a critical genus like *Carex* is rarely unrequited by discoveries of interest, but seldom is a specifically desired specimen found. A search among the copious material, unnamed or awaiting examination before being distributed, was rewarded by the finding of a sheet of *Carex novae-angliae* collected by Mr. Stewardson Brown at Ganoga Lake in June, 1898. Mr. Brown, when his attention was directed to this specimen, distinctly recalled the circumstances of its collection, and was able to furnish some data of interest. The station was remembered as in beech woods which had been burned over, lying south of the Ganoga Hotel and toward Lake Leigh. In moist depressions in this woods the sedge was found growing very abundantly, occurring in large patches of lush growth — practically the dominant species of the woodland floor.

In correspondence concerning the southernmost authentic stations previously known, Prof. Fernald's interest was incited and he wrote of having the impression that Judge Churchill had obtained the species in northwestern Pennsylvania. Material was not to be found in the Gray Herbarium and Judge Churchill wrote that he did not have it in his own collection. To Prof. Fernald's continued interest is due the final discovery of the material in the large herbarium of Mr. Walter Deane of Cambridge, Massachusetts. The specimen, critically examined by Prof. Fernald, was collected by J. R. Churchill at Corry, Pennsylvania, June 1, 1893.

Among material recently collected on the Pocono Plateau by Mr. Harold W. Pretz and contributed to the Academy Herbarium an additional station for *Carex novae-angliae* was brought to my attention.

This is at Long Pond in Monroe County. Excellent specimens were obtained July 2, 1916. Mr. Pretz's station lies at the foot of Long Pond near the outlet stream. He writes, in further detail: "The sedge was found on a slight rise in the strip of low ground lying between the stream and the more elevated and drier plateau. Marshy ground lay within a few feet. The spot was comparatively free from underbrush, grassy, and lightly shaded. The plant grew in soft mats under a group of Pitch Pines, often quite near to the trunks."

These four stations all lie in the northern half of Pennsylvania over an approximately east and west line of about two hundred and thirty miles. Those at Pocono Lake and Long Pond are on the Pocono Plateau, within a comparatively short distance of each other, and in the same geographic area. That at Ganoga Lake lies some fifty miles west, in general, of the Pocono stations, well up on the main ridge of the Alleghanies. These localities are in the northeastern part of the state but that at Corry is in the elevated portion of northwestern Pennsylvania. Although in three somewhat different areas, the stations all lie at altitudes of between one thousand and two thousand feet, where the flora shows a rather distinctive Canadian element.

The nearest, previously known and formerly southernmost, stations for *Carex novae-angliae*, I learn from Prof. Fernald and Mr. Mackenzie, are in Norfolk, Connecticut [1] (the northwestern corner of the state, in Litchfield County) and at East Windham, New York [2] (in the Catskills). The important record by Hoysradt of the plant on Little Stissing Mountain, near Pine Plains, Dutchess County, New York [3] is in all probability quite correct. In his Catalogue he states that his Carices were critically examined by William Boott, and furthermore this locality is not far distant from either the Norfolk or the East Windham stations. I am indebted to Prof. Fernald for verifying the Norfolk plant and to Mr. Mackenzie, the East Windham specimen.

For more concise reference these new records for *Carex novae-angliae* may be briefly summarized.

PENNSYLVANIA: Pocono Lake, Monroe County, June 18–21, 1907, *B. Long;* Long Pond, Monroe County, July 2, 1916, *H. W. Pretz* 8242;

[1] Bissell, RHODORA, xiii. 30 (1911).

[2] Mackenzie in Taylor, Fl. Vic. N. Y. 195 (1915).

[3] Hoysradt, Cat. Pl. Pine Plains, N. Y., page xxvii (1875–79). Bull. Torr. Bot. Cl. vi. Supplement.

Ganoga Lake [Sullivan County], June, 1898, *S. Brown;* Corry [Erie County], June 1, 1893, *J. R. Churchill.*

Specimens of these collections, except the last cited, are in the Herbarium of the Academy of Natural Sciences and have received critical examination by Mr. Mackenzie.

Academy of Natural Sciences of Philadelphia.

ANDROPOGON SCOPARIUS IN THE UNITED STATES AND CANADA.

F. Tracy Hubbard.

The marked variability of *Andropogon scoparius* is known to most collectors and different authors have described varieties and forms of the species, some of which have been raised to specific rank. With a view to classifying these variants a careful study of the species was undertaken at the suggestion of Prof. M. L. Fernald who has kindly given me his advice on numerous points. I am also indebted to Mr. Bayard Long for the loan of the material in the herbarium of the Academy of Natural Sciences of Philadelphia and to Miss K. D. Kimball of the New York Botanical Garden for notes on the type of *Andropogon littoralis.*

Many of the characters which have been used for separation of varieties or species do not prove constant enough, to have value in classification. This is the case with such features as the color of plant, length of sessile spikelet, villousness of sheaths and leaves, compression of sheaths and length of hairs at the apex of the internodes of the rhachis. Hackel in DC. Monogr. Phan. **6**: 384 (1889) describes six forms or subvarieties (along some of these lines) which are scarcely determinable except in their extreme development. The species, however, seems to divide into three reasonably marked varieties: the common widespread form with glabrous sheaths and open, elongated inflorescence which intergrades with the other two forms; the second or typical form also with an open, elongated inflorescence, described by Michaux Fl. Bor. Am. **1**: 57 (1803) "A vaginis villosis," and thus at once recognizable as the villous-sheathed form; the third form

with glabrous sheaths, but a many-branched, flabellate inflorescence. The last two forms also have fairly well marked geographic ranges.

ANDROPOGON SCOPARIUS Michx. [sensu ampliore]. *Schizachyrium scoparius* (Michx.) Nash in Small Fl. S. E. U. S. 59 (1903). Extremely variable, commonly strongly cespitose and with fibrous roots, but occasionally in sandy localities rather loosely tufted with an apparent vertical rootstock up to 5 cm. long. Color of plant green, purplish or strongly glaucous. Culms terete to rather strongly compressed, of very variable height and usually with only a few widely separated nodes, but in the sand form with the basal nodes close together and the extreme base of the culm rather indurated. Sheaths convex to strongly flattened and almost plicate, glabrous to strongly villous, the basal ones all arising from very close to the base of the culm or in the sand form from a series of closely situated nodes and apt to be strongly equitant and rather fan-spreading. Leaves variable in length and breadth, flat to frequently plicate, the mid-rib usually prominent below, glabrous on both surfaces to rather strongly villous on one or both surfaces. Inflorescence in the commoner form open and elongated with relatively few branches varying to rather dense and flabellate with many branches in var. *polyclados*. Bract-like sheaths subtending the racemes inconspicuous to rather large and spathe-like. Rachis of the raceme nearly straight to very flexuous, more or less hairy, the hairs at the top of the internodes varying from 1 to 5 mm. long. Pedicels of the sterile spikelets variable in length, erect to more or less recurved and varying in the density and length of the marginal ciliation. Sessile spikelets 4.5–11.5 mm. long with a geniculate awn 4–15 mm. long; pedicellate spikelets composed of one or less often of two empty glumes, 1–7 mm. long, awnless or terminated by an awn which may reach a length of 4 mm.

Var. VILLOSISSIMUS Kearney ex Scribn. & Ball in Bull. U. S. Div. Agrost. **24**: 41 (1900). *A. scoparius* Michx. [sensu stricto] Fl. Bor. Am. **1**: 57 (1803). *Schizachyrium villosissimum* (Kearney) Nash in Small Fl. S. E. U. S. 59 (1903). Sheaths more or less densely villous. Blades sometimes more or less villous on the lower surface, the upper surface usually villous at least near the sheath. Inflorescence open and elongated. MASSACHUSETTS: Sesachacha River, Nantucket Island, July 26, 1911, *E. F. Williams* (N. E.) [1]; Sankaty Head, Nantucket Island, July 29, 1911, *E. F. Williams* (N. E.); Nantucket, August 18, 1878, *E. & C. E. Faxon* (Gr., N. E.). NEW JERSEY: sandy barrens near Homerstown (New Egypt), Ocean Co., September 22, 1906, *J. H. Grove*, no. 403 (Ph.); common in old barren fields etc., Brindletown, Ocean Co., August 22, 1905, *J. H. Grove* (Ph.); margin

[1] In listing herbaria the following abbreviations are used: Gr., Gray; N. E., New England Botanical Club; N. Y., New York Botanical Garden; C., Columbia College, deposited at the New York Botanical Garden; Ph., Academy of Natural Sciences, Philadelphia, including the Philadelphia Botanical Club collection.

of dry sandy woods south of station on Salem Branch of W. G. & S. R. R., Tomlin, Gloucester Co., September 9, 1911, *Bayard Long*, no. 6797 (Ph.); Swedesboro, August 5, 1893, *Charles D. Lippencott* (Ph.). PENNSYLVANIA: Wilt's Mill Meadows along Trout creek E. of 12th Ward, vicinity of Allentown, Lehigh Co., *Harold W. Pretz*, no. 6099 (Ph.); meadows along N. side P. R. R. $\frac{5}{8}$ mile S. W. of Emaus P. O., vicinity of the South Mountains, Lehigh Co., August 2, 1913, *Harold W. Pretz*, no. 5994 (Ph.), August 2, 1913, *Harold W. Pretz*, no. 5995 (Ph.); woods beside road about $2\frac{1}{8}$ miles S. W. of Locust Valley P. O., Lehigh Co., October 3, 1915, *Harold W. Pretz*, no. 7977 (Ph.); vicinity of marshy meadows along Indian creek $\frac{3}{4}$ mile N. by N. E. of Sigmund, Lehigh Co., August 23, 1914, *Harold W. Pretz*, no. 7183; on serpentine, Fern Hill, Chester Co., September 7, 1908, *E. B. Bartram* (Ph.). DELAWARE: dry soil Talleyville, August 31, 1897, *A. Commons*, no. 107 (Ph.). DISTRICT OF COLUMBIA: sterile knoll of clay and sand, Deanwood, September 9, 1905, *A. S. Hitchcock*, Amer. Gr. Nat. Herb. no. 268 (Gr.). NORTH CAROLINA: moist, sandy soil, Clarkton, Bladen Co., October 7, 1897, *Biltmore Herbarium*, no. 20^b (Gr.); a very glaucous form found growing along the French Broad River near Biltmore, Buncombe Co., September 13, 1898, *Biltmore Herbarium*, no. 20^e (Gr.). SOUTH CAROLINA: damp Pine land, Santee Canal, October, *H. W. Ravenel* (Gr.). GEORGIA: rather dry pine-barrens near Brookfield, Berrien Co., September 27, 1902, *Roland M. Harper*, no. 1684 (Gr.). FLORIDA: Tampa, 1898, *Robert Combs*, no. 1348 (Gr.); Braidentown, September 19, 1900, *S. M. Tracy*, no. 7092 (Gr.); no locality, *Chapman* (Gr.). ALABAMA: Gateswood, October 30, 1903, *S. M. Tracy*, no. 8393 (Gr.). MISSISSIPPI: Biloxi, Harrison Co., September 15, 1893, *S. M. Tracy*, no. 1397 (Gr.). LOUISIANA: Jacksonville, *J. C.* (Gr.). MISSOURI: near Sulphur Springs, August 14, 1910, *Earl E. Sherff*, no. 1052 (Gr.). ILLINOIS: dry gravel hillside near Wady Petra, Stark Co., September 17, 1897, *Virginius H. Chase*, no. 126 (Ph.); Black-jack oak association, Bath, August 17, 1903, *H. A. Gleason* (Gr.). INDIANA: sand, Dune Park, September 6, 1897, *Agnes Chase*, no. 622 (Ph.). IOWA: Carnarvon, August 29, 1896, *L. H. Pammel*, no. 294 (Gr.); Winterset, September 1895, *G. W. Carver*, no. 266 (Gr.).

Variety *villosissimus* is essentially a plant of costal plain distribution along the Atlantic coast running up into Lehigh County, Pennsylvania, the mountains of North Carolina and Georgia in isolated localities and also occurring in the Mississippi basin as far north as Illinois with two rather remote stations in Iowa. As a whole the more pronounced specimens are confined to the Atlantic seaboard whereas those from the Mississippi basin usually show only slight villosity. The following specimens listed above approach var. *frequens* very closely only a few hairs being noted on one or two sheaths. NEW JERSEY: Brindletown, *J. H. Grove*. PENNSYLVANIA: N. E. of Sigmund, *H. W. Pretz*, no. 7183. DELAWARE: Talleyville, *A. Commons*,

no. 107. FLORIDA: Tampa, *R. Combs*, no. 1348. INDIANA: Dune Park, *Agnes Chase*, no. 622. ILLINOIS: Bath, *H. A. Gleason*. IOWA: Carnarvon, *L. H. Pammel*, no. 294; Winterset, *G. W. Carver*, no. 266. The inflorescence of two specimens shows a marked tendency toward var. *polyclados*. FLORIDA: Braidentown, *S. M. Tracy*, no. 7092. MISSISSIPPI: Biloxi, *S. M. Tracy*, no. 1397 [only the upper portion of the plant, which also has sparsely villous sheaths]. There is also one specimen in the herbarium of the New England Botanical Club, MASSACHUSETTS: gravelly pasture, Concord, September, *Edward S. Hoar*, which belongs in this variety, but the certainty of its being from Concord is open to some question and consequently it was omitted from the general citation of specimens.

Var. **frequens** Hubb., var. nov.[1] Plerumque dense caespitosa; vaginis foliisque glabris (laminis supra basin versus interdum paullo villosis); inflorescentia elongata simplice laxa.

Usually densely cespitose with glabrous sheaths and leaves (sometimes the base of the blade somewhat villous on the upper surface) and with an elongated, simple, open inflorescence. RHODE ISLAND: dry open fields and hillsides near Dickens Point, Block Island, Newport Co., September 15, 1913, *M. L. Fernald, Bayard Long* and *G. S. Torrey*, no. 8476 (TYPE in Gray Herb., N. E., Ph.). General distribution New Brunswick to Saskatchewan and Montana south to Georgia, Texas and eastern Arizona. The species is also reported from Washington [Nash in N. Am. Fl. **17**: 106 (1912)], but I have seen no specimens and can find no other reference to it in that state, nor have I seen specimens of this variety from Florida.

Variety *frequens* is the common form of the species showing a wide range of variation, but no constant grouping of characters which would justify subdivision. Certain specimens growing in sandy locations or in railroad ballast show more nodes at the base of the culm, more compression of the basal sheaths and a tendency to produce vertical rootstocks, but these characters are variable and not always combined. The following specimens show a strong tendency toward var. *polyclados*. PENNSYLVANIA: serpentine barrens, Mineral Hill, Delaware Co., September 6, 1908, *Francis W. Pennell*. no. 597 (Ph.). MISSOURI: fields, Hannibal, October 26, 1911, *John Davis*, no. 1425 (Gr.).

Var. POLYCLADOS Scribn. & Ball in Bull. U. S. Div. Agrost. **24**: 40 (1900). *A. littoralis* Nash in Britton Man. 69 (1901). *A. scoparius* var. *littoralis* (Nash) Hitchc. in RHODORA **8**: 205 (1906). *Schizachyrium littorale* (Nash) Bicknell in Bull. Torr. Bot. Cl. **35**: 182 (1908). Sometimes densely tufted, with more or less strongly flattened, glabrous sheaths. Leaves glabrous on the lower surface, glabrous or more or less villous above especially toward the base. Inflorescence many branched above and more or less densely flabellate.

[1] *A. purpurascens* Muhl. ex Willd. Sp. Pl. **4**: 913 (1806) and *A. flexilis* Bosc ex Poir. in Lam. Encycl. Suppl. **1**: 583 (1810) probably belong here.

MASSACHUSETTS: gravelly soil, Cambridge, October 16, 1908, *A. S. Pease*, no. 11834 (N. E.); Chilmark, Dukes Co., Marthas Vineyard, August 19, 1895, *Sydney Harris* (N. E.), pasture land, farm, August 19, 1895, *Sydney Harris* (N. E.); sandy soil, Tea Lane, Chilmark, Dukes Co., Marthas Vineyard, September 21, 1916, *F. C. Seymour* (Gr.). NEW YORK: Long Beach, Nassau Co., Long Island, September 2, 1906, *R. M. Harper* (N. Y.); Rockaway Point, Long Island, October 22, 1908, *E. P. Bicknell* (N. Y.);[1] along seashore at Staten Island, October, 1894, *Geo. V. Nash* (TYPE of *A. littoralis*, N. Y.). NEW JERSEY: Seaside Park, Ocean Co., August 30, 1908, *E. B. Bartram* (Ph.), September 27, 1908, *R. B. Bartram* (Ph.); Clementon, September 3, 1898, *Alexander MacElwee, Jr.* (Ph.); marshes at Atlantic City, 1884, *Vasey* (Gr.); Ocean City, September 4, 1912, *C. D. Fretz* (Ph.); Wildwood, September 20, 1902, *Albrecht Jahn;* dry sand dunes, Five-mile Beach, Cape May Co., October 3, 1899, *Alexander MacElwee* (Ph.), on sand dunes, September 25, 1900, *Alexander MacElwee*, no. 2024 (Ph.) [exceptional, approaching var. *villosissimus* as several of the sheaths are villous]; East Cape May, Cape May Co., September 20, 1911, *O. H. Brown* (Ph.); Cape May, October 9, 1881, *no collector given* (Ph.); Cape May Point, Cape May Co., September 16, 1906, *S. S. Van Pelt* (Ph.). PENNSYLVANIA: dry gravelly soil, Betzwood, Montgomery Co., October 16, 1900, *Alexander MacElwee*, no. 2121 (Ph.); East Park, Philadelphia, September 18, 1898, *A. F. K. Krout* (Ph.); Philadelphia, *Conard* (Ph.); Williamson School, Delaware Co., September, 1896, *Alexander MacElwee, Jr.* (Ph.); on serpentine, Goshenville, Chester Co., September 25, 1910, *E. B. Bartram*, no. 1207 (Ph.). DELAWARE: Centreville, New Castle Co., September, 1863, *A. Commons* (Ph.), dry soil, September 6, 1878, *A. Commons*, no. 106 (Ph.); sandy soil, Cedar Neck, Sussex Co., September 10, 1875, *A. Commons*, no. 108 (Ph.). GEORGIA: on the slopes and summit of Stone Mountain, De Kalb Co., altitude 1000–1686 feet, September 6–12, 1894, *John K. Small* (N. Y., C., Ph.). MISSISSIPPI: Biloxi, August 22, 1900, *S. M. Tracy*, no. 4760 (Gr.); Bayou Porto, October 14, 1897, no. 3795 (Gr.). TEXAS: prairies, Dallas, August 30, 1900, *G. Reverchon*, no. 1164 (Gr.); common prairie grass, covering extensive surfaces, Comanche Spring, September 1849, *F. Lindheimer*, no. 166 (Gr.), September 1849, *F. Lindheimer*, no. 1247 (Gr., Ph.); Rio Grande, without date, *Schott* (Gr.); Liano, October, 1847 [*F. Lindheimer* fide Dr. Robinson], no. 3 (Gr.). OKLAHOMA: Sapulpa, Creek Co., August 24, 1895, *J. W. Blankinship* (Gr.). MISSOURI: common, dry ground, Jackson Co., September 26, 1893, *B. F. Bush*, no. 382 (Gr.). KANSAS: prairie, Riley Co., September 18, 1895, *G. B. Norton*, no. 582 (Gr.). NEBRASKA?: Republican Fork, 1856, *H. Engelmann* (Gr.). IOWA: Sioux City, August 29, 1896, *L. H. Pammel*, no. 107 (Gr.); without location, 1876, *M. E. Jones*, no. 5 (Gr.).

[1] Another specimen which I believe to be from Long Island is Long Point, October 15, 1905, *E. P. Bicknell* (N. Y.).

The distribution of var. *polyclados* is essentially that of the coast plain along the Atlantic seaboard and inland up the Mississippi basin with its most marked development along the Atlantic seaboard from Marthas Vineyard southward where it was segregated as *A. littoralis*. A study of the type of *A. littoralis* Nash and of other specimens so determined by Mr. Nash fails to show any satisfactory combination of characters. It is true that these specimens usually show a tendency to have several nodes close together at the base of the culm and a marked tendency toward a vertical rootstock, but I believe these are ecological characters due to the sandy soil as gradations are common and similar tendencies were noted in var. *frequens*. The compression of the sheaths also seems too instable to carry weight and the glaucousness of the plant and the longer hairs at the apex of the internodes [this character was used by Nash to key out *A. littoralis*] do not couple with other characters. The flabellate character of the inflorescence seems reasonably constant and coupled with a definite geographic range, but intergrades with var. *frequens* and hence I believe is better considered a variety than a species. A single marked exception occurs linking this variety to var. *villosissimus* [one or two specimens of var. *villosissimus* are however noted as approaching var. *polyclados*]. New Jersey: Five-mile Beach, *MacElwee*, no. 2024. The following specimens, listed above approach var. *frequens* in a greater or less degree, but all show a noticeably flabellate tendency in the inflorescence. Mississippi: Bayou Porto, Tracy, no. 3795. Kansas: Riley Co., *Norton*, no. 582. Nebraska?: Republican Fork, *Englemann* and Iowa: Sioux City, *Pammel*, no. 107.

Boston, Massachusetts.

ADDITIONS TO THE FLORA OF CONNECTICUT.

Since the publication in 1910 of the Catalogue of Flowering Plants and Ferns of Connecticut,[1] a large amount of exploration has been done in the state and several previously unknown or inaccessible collections have been examined. The present article is an attempt to put the more important results of this work on record.[2] It includes reports of 88 indigenous and of 72 introduced species, varieties and named forms not included in the former publication. These have been marked, the native plants with an asterisk and the introduced plants with a dagger, in the following list.

[1] Bulletin no. 14 of the State Geological and Natural History Survey of Connecticut.

[2] In the case of records not here published for the first time, reference has been made in parenthesis to the original publication.

In addition there have been included a large number of new stations for the rarer species and extensions of range for those reported from restricted areas. Of such data, a considerable quantity which does not markedly modify the statements of the Catalogue has been excluded, because it seemed best to keep within reasonable limits of space. But it has been the intention to include all significant new information.

An attempt has been made to give the distribution of segregates published since 1910; but further study is likely to modify some of the conclusions here expressed.

ASPLENIUM EBENOIDES R. R. Scott. On ledges of shale, Berlin and Southington (H. C. Bigelow).

ASPLENIUM ANGUSTIFOLIUM Michx. Hartland (E. J. Winslow). Previously reported only from the trap hills of the central part of the state and from a single station in the calcareous region of the northwestern part.

DRYOPTERIS GOLDIANA (Hook.) Gray. *Aspidium Goldianum* Hook. Hartland (Bissell & Weatherby), North Canaan (Bissell), Danbury (E. J. Winslow, Weatherby). Previously reported only from the triassic region of central Connecticut.

The following hybrids in the genus *Dryopteris* have been recognized as occurring in the state.

D. CRISTATA × GOLDIANA. Plainville.

D. CRISTATA × MARGINALIS. Occasional throughout.

D. CRISTATA × SPINULOSA. Manchester, South Windsor, Windsor, Plainville, Southington, Plymouth.

D. CRISTATA, var. CLINTONIANA × GOLDIANA. Plainville, Hartland.

D. CRISTATA, var. CLINTONIANA × MARGINALIS. Manchester, Cromwell, Plainville.

D. CRISTATA, var. CLINTONIANA × SPINULOSA. Manchester, Windsor, Plainville, Southington, Cornwall.

D. CRISTATA, var. CLINTONIANA × SPINULOSA, var. INTERMEDIA. Manchester, Windsor, Plainville, Southington.

D. GOLDIANA × MARGINALIS. Southington, Plainville, Hartland.

D. GOLDIANA × SPINULOSA. Plainville.

D. MARGINALIS × SPINULOSA. South Windsor, Berlin, Plainville.

D. MARGINALIS × SPINULOSA, var. INTERMEDIA. Berlin, Manchester, Bristol, North Canaan.

* OPHIOGLOSSUM VULGATUM L., f. PSEUDOPODUM Blake. RHODORA, xv. 87 (1913). Manchester (A. W. Driggs).

EQUISETUM PRATENSE Ehrh. Salisbury (Mrs. C. S. Phelps, RHODORA, xvi. 96). Not previously reported from Litchfield Co.

* LYCOPODIUM ANNOTINUM L., var. ACRIFOLIUM Fernald. RHODORA, xvii. 124 (1915). Rare. Damp cold woods: Winchester (Bissell), Norfolk (J. H. Barbour), Colebrook (M. L. Fernald).

This variety, characterized by its firm, almost entire leaves, occurs as above. The other stations cited in the Catalogue are of true *L. annotinum*.

L. CLAVATUM, var. MEGASTACHYON Fernald & Bissell. RHODORA, xii. 53 (1910). *L. clavatum*, var. *monostachyon* of the Catalogue. Huntington (Eames). Not previously reported from Fairfield Co.

JUNIPERUS COMMUNIS L. Columbia, Southington and Hartland (Bissell & Weatherby), Mansfield (A. F. Greene), Guilford (W. R. Dudley). In the Catalogue reported only from Norwich.

SPARGANIUM AMERICANUM Nutt. Plymouth (A. E. Blewitt). Occasional throughout the southwestern part of the state. In the Catalogue reported only from eastern Connecticut.

S. LUCIDUM Fernald & Eames. Border of Alexander Pond, Killingly (Harger). Previously reported only from Hartford.

POTAMOGETON PULCHER Tuckerm. Local in ponds and slow streams near the coast.

P. ANGUSTIFOLIUS Berchtold & Presl. In the Housatonic River at Salisbury and Canaan (Eames & C. C. Godfrey), and at Kent and New Milford (Eames). In the Catalogue reported only from Oxford.

* P. CONFERVOIDES Reichenb. Rare. In ponds: Voluntown (Harger, G. E. Nichols).

RUPPIA MARITIMA L., var. ROSTRATA Agardh. Few collections of *Ruppia* with mature fruit have been examined, but most of the Connecticut material appears to be of this variety.

* R. MARITIMA L., var. SUBCAPITATA Fernald & Wiegand. RHODORA, xvi. 126 (1914). Madison (F. W. Hall, 1874; specimen in Herb. Conn. Agr. Exp. Sta.).

SCHEUCHZERIA PALUSTRIS L. Voluntown (Harger). Not previously reported east of the Connecticut valley.

SAGITTARIA ENGELMANNIANA J. G. Smith. Thompson (Weatherby). Previously reported only from southern New London Co.

ELODEA CANADENSIS Michx. The typical form of this plant, with ovate leaves, is occasional or locally abundant through the western part of the state. Narrow-leaved plants are rather common throughout the state and seem to fall into two series, of which the more lax

and narrower-leaved extreme is probably *Philotria angustifolia* (Muhl.) Britton.

* PASPALUM PUBESCENS Muhl. Rare. Sandy soil in the flood-plain of the Connecticut River, Hartford (Bissell & Weatherby).

PANICUM VIRGATUM L. The form "with two to several staminate or abortive florets to a spikelet," said to be caused by a smut (Contr. Nat. Herb., xv. 89), is often observed and sometimes abundant in certain localities (Eames).

* P. VIRGATUM L., var. CUBENSE Griseb. Groton (Graves). A somewhat intermediate form, referred to this variety by Hitchcock and Chase (Contr. Nat. Herb. xv. 92).

P. LONGIFOLIUM Torr. Killingworth (Weatherby).

P. SPRETUM Schultes. Killingworth (Weatherby), Woodstock (Harger), South Windsor (Weatherby & C. W. Vibert). Extensions of range north and west.

P. ORICOLA Hitchc. & Chase. Locally abundant on the coast in Fairfield Co. (Eames). In the Catalogue definitely reported only from Waterford.

P. ALBEMARLENSE Ashe. Southington (Andrews). In the Catalogue reported only from Waterford.

P. SCOPARIOIDES Ashe. Southbury (Harger, RHODORA, xv. 66). In the Catalogue reported only from Southington.

P. COMMONSIANUM Ashe. Sand-plains, North Haven (Andrews ex Hitchcock & Chase, Contr. Nat. Herb., xv. 92).

P. XANTHOPHYSUM Gray. Sandy soil, North Canaan (A. E. Blewitt). Rocky summit, Salisbury (W. R. Dudley; specimen in Herb. Yale University). Previously reported only from north-central Connecticut.

* P. ACULEATUM Hitchc. & Chase. Alluvial soil, Stafford (Bissell & R. W. Woodward).

* ECHINOCHLOA MURICATA (Michx.) Fernald. RHODORA, xvii. 105 (1915). Rare. Pond-margins and fields: Pomfret (Weatherby), Berlin (J. N. Bishop, RHODORA, l. c.), Killingworth (F. W. Hall; specimen in Herb. Yale University), Bridgeport (Eames, RHODORA, l. c.).

* SETARIA IMBERBIS R. & S. Rare. Wet fields: Branford (Harger), Fairfield (Eames).

† ZIZANIA PALUSTRIS L. Indian Rice. Rare. Streams flowing into Lake Congamond, Suffield (Eames & C. C. Godfrey), where it has spread from plants introduced into the lake many years ago.

* LEERSIA ORYZOIDES (L.) Sw., forma CLANDESTINA Eames. RHODORA, xviii. 239 (1916). Rare. Stratford (Eames, l. c.). Distinguished from the typical form by having the terminal as well as the lateral panicles included in the sheaths.

HIEROCHLOË ODORATA (L.) Wahlenb. A form with very large spreading panicles occurs at Fairfield (Eames).

* MILIUM EFFUSUM L. Millet Grass. Rare. Rich, rocky woods, Hartland (Bissell & Weatherby).

ORYZOPSIS PUNGENS (Torr.) Hitchc. Suffield and Simsbury (Weatherby), Morris (J. P. Brace about 1820; specimen in Herb. Williams College. Am. Journ. Sci. Ser. 1, iv. 73; RHODORA, xvi. 90). In the Catalogue not reported from west of the Connecticut River.

In the Catalogue the ranges of three species of *Muhlenbergia* of the *mexicana* group were necessarily left somewhat indefinite because of lack of data. It is now possible to make a more definite statement, as follows:—

MUHLENBERGIA SYLVATICA Torr. Occasional. Woods, borders of thickets and banks of streams.

M. FOLIOSA (R. & S.) Trin. Open bogs, wet woods, or rarely in drier ground. Frequent in the northern part of the state, becoming occasional near the coast.

The awned form has been collected at Guilford (W. R. Dudley, 1872; specimen in Herb. Yale University).

M. MEXICANA (L.) Trin. Fields, dooryards, roadsides and waste places, preferring moist, rich soil: Scotland (Weatherby), Litchfield (J. P. Brace about 1820; specimen in Herb. Williams College: RHODORA, xvi. 90), New Milford (Eames) and frequent or locally common in the central and southern parts of the state. Not reported from Tolland Co.

The awned form occurs with the typical form, but less commonly.

These three species, though offering, as defined by Prof. Scribner, a much more natural classification than the old one based on the presence or absence of the awn, are closely related, variable and not always easy to distinguish clearly. As between *M. mexicana* and the other two, a serviceable and constant character is found in the culm, which in the former, is glabrous throughout and in the two latter, minutely puberulent below the nodes.— C. A. WEATHERBY.

M. CAPILLARIS (Lam.) Trin. Cheshire (A. E. Blewitt). Otherwise known only from New Haven.

SPOROBOLUS NEGLECTUS Nash. Kent (Weatherby).

S. UNIFLORUS (Muhl.) Scribn. & Merr. Fairfield and Easton (Eames). In the Catalogue not reported from Fairfield Co.

(*To be continued.*)

E. B. HARGER,
C. B. GRAVES,
E. H. EAMES,
C. H. BISSELL,
L. ANDREWS,
C. A. WEATHERBY.

CAREX GYNOCRATES IN PENNSYLVANIA.— In Mr. Long's article on the occurrence of *Carex novae-angliae* in Pennsylvania he speaks of the fact that numerous other Canadian plants are being found in the upland region of the state, and it may be of interest to Pennsylvania botanists to know of an actual specimen of *Carex gynocrates* from Pennsylvania. In Porter's *Flora* the species is included (as *C. Redowskyana*) but without definite citation of locality or county. In the Gray Herbarium there is an excellent specimen which was collected by Goldie at Pittsburg and received from Hooker. This station is presumably now obliterated, but it is so near the stations in the upland region of central and western New York where *C. gynocrates* has long been known that search in the Alleghanian region of Pennsylvania may yet reveal the plant. In Newfoundland, southeastern Canada, and northern New England and New York the plant is found exclusively in calcareous bogs and swamps: in northern Maine, almost exclusively in arbor-vitae swamps where it forms close turf on knolls or decaying logs; but in Newfoundland, where arbor-vitae is unknown, the species is characteristic of the more calcareous swamps which are wooded with *Picia mariana* and *Larix laricina*.— M. L. FERNALD.

OENOTHERA PUMILA L. var. **rectipilis**, var. nov.— Formae typicae omnino similis, pilis caulis foliorumque recte patentibus exceptis.— NEW BRUNSWICK: dryish rocky ground, Petit Rocher, Gloucester Co., 21 Aug. 1913, *Blake* 5513 (TYPE in Gray Herb.); recent clearing, Bathurst, 25 July 1902, *Williams & Fernald*. ONTARIO: Queenston Heights, 6 July 1901, *J. Macoun*, 44,466 in part. NEW YORK (?): Niagara Falls, *Asa Gray*.

In our current manuals *Oenothera pumila* is somewhat ambiguously described as "puberulent" or "sometimes finely puberulent." The extensive series in the Gray Herbarium and the herbarium of the New England Botanical Club, with the exception of the above cited specimens, is invariably strigillose or puberulous with appressed or sometimes merely incurved hairs, generally dense but sometimes sparse in age (although never quite lacking), and is at once distinguishable from var. *rectipilis*. The latter is probably the only form occurring on the southern shore of the Baie des Chaleurs in New Brunswick; the two collections from that region are the only specimens of either form of the species from New Brunswick which I have examined. At the Ontario locality var. *rectipilis* apparently occurs with the typical form, since one of the four specimens representing *Macoun* 44,466 in the Gray Herbarium is clearly referable to true *O. pumila*. In all features but pubescence var. *rectipilis* seems quite indistinguishable from ordinary *O. pumila* L.— S. F. Blake, Stoughton, Massachusetts.

A Diagnostic Character of Nuphar microphyllum.— The writer has often noticed in collecting *Nuphar microphyllum* [1] that the fruit is quite naked at base, that is, without the rings of partly decayed filaments which abound at the base of the fruit in all our other species of the genus. This character, which apparently is not recorded in the descriptions of the species, is of great diagnostic value, especially in separating *N. microphyllum* from small forms of *N. rubrodiscum*. The character, although not mentioned in the description, is well brought out in the photograph of fruit of *N. microphyllum* in Miller & Standley's paper on "The North American Species of Nymphaea." [2] — M. L. Fernald, Gray Herbarium.

Taraxacum ceratophorum in New England.— On 27 July, 1909, a single plant of a *Taraxacum* clearly differing in appearance from the familiar New England species was collected by the writer in a moist gully (at an elevation of about 4500 feet) in King's Ravine, Mt. Adams,

[1] Nuphar **microphyllum** (Pers.), n. comb. *Nymphaea microphylla* Pers. Syn. ii. 63 (1807). *Nymphaea lutea, β Kalmiana* Michx. Fl. Bor.-Am. i. 311 (1803). *Nuphar Kalmiana* Ait. Hort. Kew. ed. 2. iii. 295 (1811).

[2] Contrib. U. S. Nat. Herb. xvi. pt. 3. t. 35.

New Hampshire. A study of the plant made at the Gray Herbarium not long after its collection seemed to indicate its identity with *T. ceratophorum* (Ledeb.) DC., but since the specimen was barely in flower it seemed desirable to wait until fruit might be obtained. In spite of several searches made since that time no more plants have been discovered, but recently a second and more careful comparison of the same specimen has been made, with the kind help of Professor Fernald, and there seems no room for doubt that the former identification was correct. *Taraxacum ceratophorum* is represented in the Gray Herbarium by specimens from similar situations in the Shickshock Mountains and from the cliffs at Bic, Quebec, as well as from further west. The station at Bic, which is about 250 miles distant, is the nearest yet known to that on Mt. Adams. It is to be hoped that other gullies on the Presidential Range may reveal the same species, which forms an interesting addition to the slowly increasing alpine flora of the White Mountains. The specimen here discussed has been deposited in the herbarium of the New England Botanical Club.— ARTHUR STANLEY PEASE, Cambridge, Massachusetts.

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Rhodora

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A NEW RUDBECKIA FROM INDIANA.

S. F. Blake.

In an interesting collection of Indiana plants recently sent to the Gray Herbarium by Mr. Charles C. Deam were several specimens of a Cone-flower of the *Rudbeckia speciosa* group which Mr. Deam suspected might prove to be new. The plant, although rather closely allied to *R. speciosa* Wenderoth and its var. *Sullivantii* (Boynton & Beadle) Robinson — the latter of which was collected by Mr. Deam in the same general region — proves in fact to be undescribed, and may be called, in recognition of the careful and extensive collecting done by its discoverer in various parts of the United States and in Central America,

Rudbeckia **Deamii**, sp. nov. Perennis stolonifera stolonibus brevibus apice foliatis. Caulis simplex subtenuis erectus ad 6 dm. altus striatus dense hirsutus pilis albidis retrorsis ad apicem caulis adscendentibus. Folia stolonum ovata vel ovali-ovata acuta basi subabrupte contracta deinde acute cuneata tenuia membranacea triplinervia vel subquintuplinervia supra subdense sed vix aspere hirsuto-pilosa pilis adscendentibus vel subappressis basi vix dilatatis subtus paullulo pallidiora similiter pubescentia crenato-serrata dentibus ca. 6-jugis depressis mucronulatis 7–10(–13.5) cm. longa 3.5–5.2 (–6) cm. lata, in petiolis retrorse hirsutis vix marginatis 5–9 cm. longis; folia caulina 10–11 (supremis 1–2 bracteiformibus lanceolatis integris 2–4 cm. longis exclusis), 2–3 infima eis stolonum similia; media et superiora ovata acuminata basi cuneata sessilia subamplectentia 7.5–15.5 cm. longa 2.8–5 cm. lata. Capitula 1–2(–4) caulem et ramum axillarem terminantia 4.5–6 cm. lata; pedunculi sulcati hispido-pilosi pilis adscendentibus vel subappressis 9.5–13.5 cm. longi; discus late conicus obtusus 1.1 cm. altus 1.3 cm. crassus. Involucri

2(–3)-seriati reflexi 1.2–1.5 cm. longi phyllaria extima herbacea inaequalia lanceolata acuta mucronulata ciliata et utroque hispido-pilosa 2.5–4 mm. lata; interiora 1(–2)-seriata anguste lanceolata acuminata basi paullum indurata et pallida ceterum herbacea ciliata et extus breviter hispido-pilosa intus glabra vel subglabra extimis duplo breviora. Radii 12–14 lineari-cuneati valde bidentati supra aurantiaco-flavi (colore basi vix saturatiore) subtus dorso appresso-pilosuli (1.6–)2.2–2.5 cm. longi (4–)5–6 mm. lati; corollae disci fusco-purpureae glabrae 4 mm. longae (tubo indistincto 0.7 mm., dentibus lanceolato-triangularibus 0.8 mm.). Paleae acutae ad apicem subscariosae et erosulae glabrae vel in carina sparsissime pilosae 5 mm. longae. Achaenia nigra glabra quadrangularia 2.5 mm. longa (pappo coroniforme brevissimo paullum eroso in angulis achaenii non producto incluso). Antherae basi valde sagittatae. Styli rami apice subtruncati hispidi.

Stem simple, slender, erect, about 6 dm. high, densely retrorse-hirsute, appressed-hairy above, with short leafy off-shoots. Leaves of the stolons ovate or oval-ovate, acute, at base rather abruptly contracted, then cuneately narrowed into the petiole, thin, trip1i- or quintuplinerved, crenate-serrate (teeth about 6 pairs, depressed, mucronulate), hirsute-pilose both sides with ascending or subappressed hairs, slightly paler beneath, 7–10 cm. long, 3.5–5.2 cm. wide; stem-leaves 10–11 (with 1–2 additional lanceolate entire bracts 2–4 cm. long above), the 2–3 lowest similar to those of the stolons, the others ovate, acuminate, cuneate to base, subamplexicaul, 7.5–15.5 cm. long, 2.8–5 cm. wide. Heads 1–2(–4), terminating the stem and an axillary branch, 4.5–6 cm. wide; peduncles sulcate, hispid-pilose with ascending or subappressed hairs, 9.5–13.5 cm. long; disk broadly conic, obtuse, 1.1 cm. high, 1.3 cm. thick. Involucre 2(–3)-seriate, reflexed, 1.2–1.5 cm. high, the outermost phyllaries unequal, herbaceous, lanceolate, mucronulate, acute, ciliate, hispid-pilose both sides, 2.5–4 mm. wide; the inner 1(–2)-seriate, narrowly lanceolate, acuminate, at base slightly indurated and pale, otherwise herbaceous, ciliate, on the outer face shortly hispid-pilose, on the inner glabrous or subglabrous, half as long as the outer phyllaries. Rays 12–14, linear-cuneate, strongly bidentate, orange-yellow scarcely deeper at base, on back appressed-pilosulous, 2.5 cm. long, 5–6 mm. wide; corollas of disk deep purple, glabrous, 4 mm. long (the indistinct tube 0.7 mm., the lance-triangular teeth 0.8 mm. long). Pales acute, at apex subscarious and finely erose, more or less colorate, glabrous or with a few hairs along the keel, 5 mm. long. Achenes black, glabrous, quadrangular, 2.5 mm. long (including the very short coroniform slightly erose pappus, which is not produced over the angles). Anthers strongly sagittate. Style-branches subtruncate, hispid at apex.

INDIANA: a single colony in dry, black, friable soil along Wild Cat Creek, Carroll Co., 2 Sept., 1916, *Charles C. Deam* 21,674 (TYPE in Gray Herb.).

Most nearly related to *R. speciosa* Wenderoth, from which it differs in its dense retrorse pubescence, its much broader and thinner stem-leaves (practically uniform in size and shape with these of the stolons, instead of much narrower and longer as in *R. speciosa*), and its outer phyllaries which are rather densely pubescent on the inner as well as outer face. Also close to *R. speciosa* var. *Sullivantii* (Boynton & Beadle) Robinson, which however has a sparse harsh pubescence if any on the stem, thick leaves, thick blunt phyllaries scarcely pubescent on the upper side, and always apically ciliate pales.

Gray Herbarium.

COLOR FORMS OF IMPATIENS BIFLORA.

C. A. Weatherby.

The common jewel-weed produces an unusually interesting series of color variations. In their range of hues they are very similar to those of the garden "nasturtium" (*Tropaeolum majus* L.) and, were it worth while, could doubtless be made to develop, under cultivation, as many shades and gradations of color. Indeed, Professor Fernald tells me of one locality where, possibly through the juxtaposition and crossing of several forms, something of the sort has already happened in the wild. The forms known to the writer and described below appear, however, to represent the main lines of variation. The flowers, in the dried specimens cited, have in most cases lost all their color, but the collectors' notes give the needed information.

Impatiens biflora Walt. Perianth orange, with more or less numerous, usually crimson spots. The typical and common form.

Forma **citrina**, f. nov. Perianthiis flavis modo *Citri Limonum* fructus, coccineo-maculatis. Perianth lemon-yellow, with crimson spots. Connecticut: Moist thicket, Thompson, Sept. 7, 1908, *Bissell & Weatherby* (type, in Gray Herb.).

Forma **albiflora** (Rand & Redfield), comb. nov. *I. fulva*, f. *albiflora* Rand & Redfield, Fl. Mt. Desert 88 (1894). "Flowers white or cream-color," the spots often paler than in the typical form, then pink or brownish red. Maine: Southwest Harbor, *Rand;* Farmington, Aug. 15, 1894, *Fernald*, "white with pink spots." Massachusetts:

Edge of pool, Billerica, Aug. 12, 1911, *Weatherby*, "petals white, the spur cream-color"; Eat-fire Spring, Nantucket, Aug., 1896, *L. L. Dame*, "flowers cream-color." Minnesota: Tower, Aug., 1889, *E. J. Hill*, "nearly white, spotted with red." Britton (Cat. Pl. N. J. 74 (1889)) reports "a form with white flowers" at Toms River, N. J., on the authority of Dr. Knieskern.

I have not seen a pure albino form nor have I found an altogether certain, first-hand report of one. In the palest flowers seen by me, at least the saccate sepal is cream-color, the color being strongest in the spur. I am therefore leaving f. *albiflora* for the present, as defined by Rand & Redfield, to cover both cream-colored and reported white flowers. The pure albino, if it occurs, will probably prove to be a distinct strain, making, with f. *citrina* and the cream-colored element of f. *albiflora*, a series — pure yellow, pale yellow, white — such as is known to exist in *Gratiola aurea*.[1] Mr. Rand writes me as follows in regard to the type of f. *albiflora:*

"I fear that the 'forma *albiflora*' mentioned in the Mt. Desert Flora was in reality the form with cream-colored flowers. I know just where the plant grew that I had in mind, and it may grow there yet. Plants with flowers of a purer white have been observed, but I. . .did not regard them as distinct."

Forma *albiflora*, then, was founded on a plant with cream-colored flowers and the name, though inappropriate, will have to be retained for the cream-colored form, should the two strains prove distinct.

Forma **Peasei** A. H. Moore, f. nov.[2] Perianthiis roseis, rubro-maculatis. Perianth pink, spotted with deeper red. Maine: Hartford, 1886, *Parlin*. New Hampshire: Damp roadside, Whitefield, Sept. 2, 1913, *A. S. Pease*, no. 14,506 (type, in Herb. N. E. Bot. Club), "flowers pink"; Jefferson, Aug. 26, 1901, *Edith Cook;* Aug. 26, 1907, *A. S. Pease*, no. 10,741; Jackson, Aug. 22, 1909, *Harold St. John*, "roseate form." New York: Downsville, Delaware Co., 1891, *Miss C. G. Orton*. A specimen from Oxford, Connecticut, Sept. 10, 1903, *E. B. Harger*, no. 4344, described by the collector as having flowers "pale flesh-color to salmon-pink," may represent another strain.

In all of the above forms the spots are present, as in the typical

[1] See Rhodora, ix. 123 (1907). Cream-colored or pale yellow variants of several yellow flowers are known to occur. *Impatiens pallida*, *Potentilla pumila*, *Hypericum punctatum*, and *Rudbeckia hirta* are cases in point. In *I. pallida* an albino form has been reported by Clute.

[2] Named for Professor A. S. Pease, as a small recognition of his untiring work in the study of the flora of Coös County, New Hampshire.

form. According to collectors' notes and what I have seen myself, they vary somewhat in color, from crimson to pink and brownish red, and very much in number. In some individuals they are few and scattered and in others so numerous as to coalesce in an irregular crimson spot on the lower spreading petal. But in all these forms they exist without essential change of hue, quite independently of the variations of the body-color of the perianth. In a fifth form, however, the perianth is orange, as in the typical form, but the spots are entirely absent. Rough tests of the pigment of these spotless flowers gave different results from the same tests applied to flowers of two spotted forms, of which fresh material was available at the time. This form may be called

Forma **immaculata**, f. nov. Perianthiis aurantiacis, sine maculis. Perianth orange, without spots. MAINE: Springy woods, St. Francis, Aug. 16, 1893, *Fernald*, no. 21a (TYPE, in Herb. Gray); Bar Harbor, Aug. 31 (no year given), *Kate Furbish*. VERMONT: Mt. Mansfield, Aug., 1877, *Faxon*. MINNESOTA: Lac qui Parle (no date or collector), "without spots."

Certain facts about these forms may be worth noting. As might be expected in a species producing cleistogamous flowers, they show abundant ability to maintain themselves. Forma *Peasei* was collected at the same station in Jefferson, New Hampshire, in 1901 and 1907. Forma *albiflora* at the Billerica station, where conditions are unfavorable for its spreading, was present in about the same quantity in 1914 as when I first saw it there in 1911. Forma *citrina* at Thompson, where conditions were more favorable, increased considerably between 1908 and 1914, though the station is now likely to be exterminated by the building of a state road. That is, these forms are apparently not recurrent but unstable variations, like, for instance, *Viola pedata*, f. *rosea*,[1] but, once established, tend to remain as fixed and genetically constant lines.

At the Billerica and Thompson stations the forms occur in pure colonies, associated with, even mingled with, the typical form, but not grading into it nor into any of the other variant forms. That is, at Billerica, all the variant plants are f. *albiflora*, at Thompson, practically all f. *citrina*. At the latter place, out of scores of plants, two exceptions were noted in which the color was somewhat intermediate between f. *citrina* and typical *I. biflora*. These, however,

[1] See RHODORA, xiv. 22 (1912).

were very probably due to crossing. Many bees were at work on the flowers and appeared to visit both forms indiscriminately.[1]

The colors developed in these variants occur normally in other species of the genus. *I. racemosa* DC., *I. Dalzellii* H. f. & T., *I. repens* Moore, etc. are yellow; *I. porrecta* Wall., *I. laevigata* Wall., *I. longipes* H. f. & T. and others are cream-color; *I. capensis* Thunb., *I. modesta* Wight, and *I. diversifolia* Wall., pink. We have here, as in *Gratiola aurea,* a series of variants correlated with ancestral tendencies in the genus, and perhaps arising from the loss of elements present in the typical form.

Water-color drawings of formae *albiflora* and *citrina* have been kindly made for me by Miss Una L. Foster and are deposited in the Gray Herbarium. It is hoped to complete the series of drawings as opportunity offers to get fresh material.

EAST HARTFORD, CONNECTICUT.

[1] Both honey-bees and a small species of humble-bee visited the flowers. The honey-bees invariably plunged into them in the fashion needed for effecting pollination, pushing their way into the sac until only their "business ends" were visible. The humble-bees, on the other hand, alighted in the same position as the honey-bees, but instantly and with entire unanimity, turned over, hung upside down beneath the flower and tried to pierce the spur and extract the nectar from the outside. So far as I could judge, the swaying of the flower and the elasticity of the spur, frequently defeated this attempt. Some insect rifles the nectaries of *Habenaria blephariglottis* after the same fashion and with better success. In some dozens of spikes of this species which I examined last summer, nearly all the spurs were punctured, but I could not catch the burglar at work.

ADDITIONS TO THE FLORA OF CONNECTICUT.

(*Continued from page 110.*)

AGROSTIS ALBA L. The teratological form known as *A. sylvatica* L. is plentiful at one locality in Stratford (Eames).

A. ALBA L., var. ARISTATA Gray. Seymour (Harger). Occasional in the southwestern part of the state where, however, it constantly intergrades with the typical form.

A. PERENNANS (Walt.) Tuckerm. The weak or decumbent form with looser panicles and lax blades, which has been separated as *A. Schweinitzii* Torr. is occasional in moist woods throughout.

A. CANINA L. Franklin (R. W. Woodward). In the Catalogue not reported east of the Connecticut valley. A peculiar autumnal form producing tufts of leaves from the nodes occurs at Sharon (Bissell, R. W. Woodward and Weatherby, RHODORA, xiii. 30).

† APERA SPICA-VENTI (L.) Beauv. Roadside, Bridgeport (Eames). Adventive from Europe.

CINNA LATIFOLIA (Trev.) Griseb. Pistapaug Mt., Durham (Bissell). Previously known only from the northwestern part of the state.

† AVENA FATUA L. Two or three clumps in newly-seeded grass-land, East Windsor (Bissell), Bridgeport (Eames).

† A. PUBESCENS Huds. Plentiful at one station, Woodbury (Harger). Fugitive or adventive from Europe.

SPARTINA MICHAUXIANA Hitchc. South Windsor (Bissell), New Hartford and Newtown (A. E. Blewitt). Extensions of range northward.

PHRAGMITES COMMUNIS Trin. Oxford (Harger).

* ERAGROSTIS PECTINACEA (Michx.) Steud., var. SPECTABILIS Gray. Sandy wastes on the coast: Bridgeport (C. K. Averill, Eames). Probably not rare.

MELICA STRIATA (Michx.) Hitchc. Winchester (A. E. Blewitt).

BRIZA MEDIA L. Old Lyme (A. E. Blewitt).

CYNOSURUS CRISTATUS L. Hartford (J. P. Brace, 1861; specimen in Herb. Williams College: RHODORA, xvi. 87). Well established in grass-land: Branford and Fairfield, not rare in newly seeded lawns, whence it readily spreads (Eames).

* GLYCERIA FERNALDII (Hitchc.) St. John. RHODORA, xix. 75 (1917). *G. pallida* (Torr.) Trin., var. *Fernaldii* Hitchc. RHODORA,

viii. 211 (1906). Guilford (W. R. Dudley; specimen in Herb. Yale University), East Hartford (Weatherby).

Puccinellia fasciculata (Torr.) Bickn. *P. Borreri* (Bab.) Hitchc. Along the coast: rare eastward, becoming occasional westward.

P. distans (L.) Parl. Rare. Sea beaches and borders of salt marshes: East Haven (Harger), Orange (Bissell), Bridgeport (Eames).

P. paupercula (Holm) Fernald & Weatherby, var. alaskana (Scribn. & Merr.) Fernald & Weatherby. Rhodora, xviii. 18 (1916). *P. angustata* Rand & Redfield, not *Poa angustata* R. Br. Rare. Shore of Blackhall River, Old Lyme (Graves).

The genus *Puccinellia* is here treated according to the revision by Fernald & Weatherby (Rhodora, xviii. 1–22), much of the material referred in the Catalogue to *P. distans* being here included under *P. fasciculata* (*P. Borreri* of the Catalogue).

Our species as recognized here may be distinguished by the following key (adapted from Fernald & Weatherby):—

A. Lower branches of the comparatively short panicle (0.2–1.6 dm. long) densely flowered nearly to the base or at least below the middle; lemmas thick and coriaceous, without a broad hyaline tip; the midnerve reaching the apex of the lemma, often excurrent as a very short mucro ..... *P. fasciculata*

A. Lower branches of the panicle floriferous chiefly above the middle; lemmas thin and membranaceous in texture, or at least with a broad hyaline tip; the midnerve not excurrent. B.

B. Lemmas erose-ciliolate or serrulate under a lens ..... *P. distans*

B. Lemmas essentially entire ..... *P. paupercula*, var. *alaskana*

* Festuca rubra, var. subvillosa Mert. & Koch. Dry, rather barren hillside pastures and in a lawn: Franklin (R. W. Woodward, Rhodora, xiii. 70).

† Festuca ovina L., var. duriuscula (L.) Koch. Established in grass-land about an old house at Branford (Eames), East Haven and Southington (Andrews).

Bromus hordeaceus L. Grass-land and about lawns in Bridgeport and Fairfield (Eames).

† B. hordeaceus L., var. leptostachys (Pers.) Beck. Bridgeport and Fairfield, growing with the species in about equal numbers. Apparently introduced in grass-seed (Eames).

B. commutatus L. New London (Graves), New Haven (Harger), Waterbury and Woodbury (A. E. Blewitt). Occasional in southwestern Connecticut (Eames).

† B. arvensis L. Well established in several dry fields, roadsides and wastes: Bridgeport (Eames). Introduced from Europe.

† B. JAPONICUS Thunb. Naugatuck (A. E. Blewitt). Fugitive from Eurasia.

B. INCANUS (Shear) Hitchc. Willimantic (G. E. Nichols), Colchester, Southbury and Oxford (Harger), Windsor (Weatherby), Waterbury (A. E. Blewitt).

B. INERMIS Leyss. Bridgeport (Eames).

† B. INERMIS Leyss., var. ARISTATUS Schur. Winchester (A. E. Blewitt), Bridgeport (Eames).

† B. MARGINATUS Nees. Waste ground, Naugatuck (A. E. Blewitt). Fugitive from the northwestern United States.

LOLIUM MULTIFLORUM Lam. Bridgeport (Eames).

† L. MULTIFLORUM Lam., var. DIMINUTUM Mutel, Fl. France, iv. 139 (1837). *L. Boucheanum* Kunth. Fields and roadsides: East Haven (Bissell), Bridgeport (Eames), Greenwich (Bissell & Weatherby). This has been confused with *L. perenne*. Forms intermediate between this and the typical form occur at Fairfield and Bridgeport (Eames).

The above forms are difficult to distinguish in herbarium material by any clear characters, but are kept apart as sub-species or even as species by practically all recent European authors on the ground that one is annual and the other perennial. The specimens cited under the variety, except that from Greenwich, were referred to *L. perenne* in the Catalogue.

The following key may help to distinguish these plants:—

A. Unexpanded leaves folded; rachis usually smooth except on the angles; glumes of the upper spikelets exceeding the contiguous floret, usually more than half the length of the spikelet.....*L. perenne*

A. Unexpanded leaves rolled in from each margin toward the mid-vein; rachis usually roughened; glumes of the upper spikelets not exceeding the contiguous spikelet. B.

B. Annual; spikelets 10–20-flowered; glumes of the lowest spikelets often exceeding the contiguous floret.....*L. multiflorum*

B. Perennial; spikelets 5–8(9)-flowered; none of the glumes exceeding the contiguous floret.....*L. multiflorum*, var. *diminutum*

† L. TEMULENTUM L., var. LEPTOCHAETON A. Br. Associated with the typical form, Bridgeport (Eames).

† HORDEUM TRIFURCATUM Jacq. Rare. Waste ground and fence-rows: Berlin and Southington (Andrews).

† H. CAPUT-MEDUSAE (L.) Cosson. Formerly abundant along a roadside at Bridgeport, but the station has since been destroyed (Eames). Fugitive from Europe.

† H. MURINUM L. Wall Barley. Way Bent. Waste ground:

Naugatuck (A. E. Blewitt, Rhodora, xiv, 163). Fugitive from Europe.

* Elymus halophilus Bickn. Occasional or frequent along the coast in various moist or dry situations (Eames).

E. australis Scribn. & Ball. Thompson (Weatherby). Previously reported only from New Haven.

Eleocharis tuberculosa (Michx.) R. & S. Killingworth (Weatherby), Ellington (Harger), South Windsor (C. W. Vibert & Weatherby). Extension of range northwestwardly.

* Scirpus Smithii Gray, var. setosus Fernald. Wet alluvial soil, Voluntown (Bissell, Rhodora, xiii. 30).

S. Torreyi Olney. South Windsor (C. W. Vibert), Waterbury (A. E. Blewitt). In the Catalogue reported only from Lyme.

* S. occidentalis (Watson) Chase. Borders of ponds and slow streams: Hartford (Chas. Wright; specimen in Herb. New England Bot. Club), Goshen (Bissell & Weatherby), Sharon and Salisbury (Eames & C. C. Godfrey, Rhodora, xvi. 19). At the Goshen station occur both forms mentioned by Mrs. Chase in her description.

* S. rubrotinctus Fernald, var. confertus Fernald. Wet meadows: Southington (Bissell, Rhodora, xiii. 55), Waterbury and Barkhamsted (A. E. Blewitt).

S. atrovirens Muhl. Occasional in western Connecticut.

* S. Peckii Britton. Low, moist meadows: Barkhamsted and Winchester (A. E. Blewitt, Rhodora, xv. 98).

S. pedicellatus Fernald, var. pullus Fernald. Bank of Farmington River at New Hartford (A. E. Blewitt).

* S. Longii Fernald. Rhodora, xiii. 6 (1911). Borders of sloughs in sand-plain: South Windsor (C. W. Vibert).

Rynchospora fusca (L.) Ait. f. Killingworth (W. R. Dudley), Haddam (F. W. Hall), South Windsor (Weatherby), Norfolk (J. P. Brace; specimen in Herb. Williams College: Rhodora, xvi. 86). The last station a northwesterly extension of range.

R. capillacea Torr. Open, grassy pond-margin, Salisbury (Mrs. C. S. Phelps, Rhodora, xiii. 30).

* C. scoparia Schkuhr, var. subturbinata Fernald & Wiegand. Rhodora, xiv. 116 (1912). Dry or damp sandy soil: New London and Franklin (Graves). The perigynia in these specimens are shorter than is usual in *C. scoparia.*

C. cristata Schwein. North Canaan (A. E. Blewitt), Greenwich

(Bissell & Weatherby), Bridgeport (Eames). In the Catalogue not reported south of Huntington.

C. ALBOLUTESCENS Schwein. South Windsor (A. E. Blewitt), Bridgeport and Fairfield (Eames). In the Catalogue reported only from New London and Tolland Counties.

* C. STRAMINEA Willd., var. ECHINODES Fernald. Rich, open ground, Beacon Falls (A. E. Blewitt).

C. BICKNELLII Britton. Apparently occasional throughout the state, but usually in small quantity at any place.

* C. FESTUCACEA Schkuhr. Rare. Dry fields: Southington (Andrews), Thomaston and Waterbury (A. E. Blewitt).

C. BEBBII Olney. Canaan (R. W. Woodward), Sharon (H. S. Clark), New Fairfield (Harger) North Canaan, Newtown, and Brookfield (A. E. Blewitt), Greenwich (Bissell & Weatherby). In the Catalogue reported only from Salisbury.

C. BRUNNESCENS Poir. Waterbury (A. E. Blewitt), Stafford (A. W. Driggs). Not previously reported east of the Connecticut River.

C. DEWEYANA Schwein. Durham (Weatherby, Eames & C. C. Godfrey), Guilford (Eames & C. C. Godfrey). An extension of range southeastward.

C. TRISPERMA Dewey, var. BILLINGSII Knight. Much more common than was supposed at the time of publication of the Catalogue. It is a characteristic plant of cold sphagnum bogs where it takes the place of the typical form, which prefers swampy, but less sphagnous woods. Occasionally,.however, the two grow together, showing that the variety is not merely an ecological state.

† C. MURICATA L. Waste ground, Bridgeport (Eames). Introduced from Europe.

C. TENELLA Schkuhr. Waterbury and Danbury (A. E. Blewitt).

* C. ALOPECOIDEA Tuckerm. Border of swale, North Canaan (Harger).

C. DIANDRA Schrank. Open swamps: Suffield and Sharon (Harger), Granby (Weatherby). Previously reported only from Salisbury.

C. DIANDRA Schrank, var. RAMOSA (Boott) Fernald. Abundant in a boggy pasture, North Canaan (A. E. Blewitt). Previously reported only from Salisbury.

* C. LAEVIVAGINATA (Kükenth.) Mackenzie in Britton & Brown, Ill. Fl. Ed. 2, i. 371 (1913). Open marshes and meadows: "Connecticut" (Chas. Wright, 1878, the exact locality uncertain), Durham

and Guilford (Eames & C. C. Godfrey), Cromwell and Salisbury (Weatherby), Sharon (Harger), Danbury (A. E. Blewitt) and frequent or locally common in southwestern Connecticut. An Alleghenian species closely related to, and previously confounded with, *C. stipata*, from which it differs in having the hyaline band of the sheaths smooth, not puckered, and with a conspicuous cartilaginous apex, which is yellow after drying, and in its longer perigynia with beak equalling or longer than the body.

C. AQUATILIS Wahlenb. Middlebury (Harger).

C. STRICTA Lam., var. CURTISSIMA Peck. Middletown (Joseph Barratt; specimen in Herb. Wesleyan University).

C. STRICTA Lam., var. DECORA Bailey. Waterbury (A. E. Blewitt). An extension of range westward.

C. POLYGAMA Schkuhr. Waterbury (H. J. Bassett, 1862), Fairfield (Eames).

* C. BUSHII Mackenzie. Bull. Torr. Bot. Club, xxxvii. 241 (1910). Rare. Dry fields: Milford and Bridgeport (Eames).

C. UMBELLATA Schkuhr. Common or frequent over most of the state in dry fields or open woods.

C. UMBELLATA Schkuhr, var. TONSA Fernald. Old Lyme (Bissell & Weatherby), Middletown (Weatherby). In the Catalogue reported from a single station in North Stonington.

C. UMBELLATA Schkuhr, var. BREVIROSTRIS Boott. Ledyard (Graves), Old Lyme (Bissell & Weatherby), Franklin, New Haven and "towns west" (R. W. Woodward, RHODORA, xiii. 68; xv. 95), Roxbury (Weatherby). In the Catalogue reported only from Cheshire.

* C. NOVAE-ANGLIAE Schwein. Rocky hillside woods, Norfolk (Bissell & R. W. Woodward, RHODORA, xiii. 30).

C. LIMOSA L. Suffield (G. E. Nichols).

C. PTYCHOCARPA Steud. Guilford (W. R. Dudley; specimen in Herb. Yale University). Previously reported only from Waterford.

C. LAXIFLORA Lam., var. GRACILLIMA Boott. Farmington (Chas. Wright; specimen in Herb. New England Bot. Club). In the Catalogue reported only from western Connecticut.

C. LEPTONERVIA Fernald. RHODORA, xiv. 214 (1914). *C. laxiflora* Lam., var. *leptonervia* Fernald. Cheshire and Waterbury (A. E. Blewitt).

C. HITCHCOCKIANA Dewey. Cheshire and Woodbury (A. E.

Blewitt), Hartland (Bissell & Weatherby). Previously reported only from the trap ridges of central Connecticut.

C. GLAUCODEA Tuckerm. Hamden (A. E. Blewitt), Guilford (Eames & C. C. Godfrey).

C. GRANULARIS Muhl. Stratford (Eames), Greenwich (Bissell & Weatherby). Southwestern extensions of range.

C. FLAVA L. Killingworth (G. H. Bartlett), North Branford (Harger), Greenwich (Bissell & Weatherby). Extensions of range to the east and south.

C. FLAVA L., var. RECTIROSTRA Gaudin. Margins of Blakeley's Pond, Norfolk (A. E. Blewitt), and Dog Pond, Goshen (Bissell & Weatherby). Not previously reported west of the Connecticut River. At Dog Pond it fruits notably later than the typical form, with which it grows.

C. DEBILIS, var. RUDGEI × VIRESCENS. Franklin (R. W. Woodward, RHODORA, xiii. 69).

C. DEBILIS Michx., var. INTERJECTA Bailey. Guilford (W. R. Dudley; specimen in Herb. Yale University). In the Catalogue reported only from Southington.

C. TRICHOCARPA Muhl. Middletown (Joseph Barratt, 1833; specimen in Herb. Wesleyan University), Southbury (Harger, RHODORA, xv. 66), Newtown (A. E. Blewitt), Oxford (Harger). Extensions of range to the east and south.

C. SQUARROSA L. Sharon (H. S. Clark), Greenwich (Eames & W. H. Hoyt). In the Catalogue not reported from Litchfield or Fairfield Counties.

C. TYPHINA Michx. Fairfield (Eames). Previously reported only from the central lowland.

* C. SUBULATA Michx. Sphagnous swamp in partial shade, Cromwell (Dr. E. J. Thompson, RHODORA, xiii. 78).

C. BULLATA Schkuhr, var. GREENEI (Boeckl.) Fernald. North Canaan (A. E. Blewitt). Previously known only from east of the Connecticut River.

ARISAEMA TRIPHYLLUM (L.) Schott. The form with the lateral leaflets lobed occurs at Cromwell (Dr. E. J. Thompson, RHODORA, xiii. 78), Oxford (Harger) and Salisbury (Weatherby).

The form described as var. *pusillum* Peck occurs at Middlefield and Windsor (Weatherby) and is occasional in the western part of the state.

The form described as *A. Stewardsonii* Britton occurs on shaded river-banks and in wet woods at South Windsor (C. W. Vibert), Watertown (Harger, Weatherby), Wilton (G. P. Ells), Salisbury (Weatherby).

* Eriocaulon Parkeri Robinson. Rare. Tidal flats of Mill River, New Haven and Hamden (Eames, 1899) and similar situations along the Housatonic River, Stratford (Eames). Previous to its recognition at these stations known only from the estuaries of the lower Delaware River and Chesapeake Bay. No admixture with *E. septangulare* has been observed, the latter appearing to be confined to freshwater shores beyond tidal influence.—E. H. Eames.

Xyris flexuosa Muhl. Change the statement of range in the Catalogue to read:— Occasional in New London Co. and on the sandplains of central Connecticut; rare elsewhere, reaching Union (Bissell), Killingworth (Harger et al.), Ellington (Harger).

X. Smalliana Nash. Voluntown (Graves), Haddam (W. R. Dudley; specimen in Herb. Yale University).

† Tradescantia reflexa Raf. Waste ground, Naugatuck (A. E. Blewitt, Rhodora, xiv. 163). Fugitive from the southwestern United States.

Pontederia cordata L., var. angustifolia Torr. East Lyme (Bissell), Groton (Harger), Suffield (Eames & C. C. Godfrey).

Juncus tenuis L., var. anthelatus Wiegand. Franklin (R. W. Woodward), New Fairfield (Harger). Occasional near the coast in southwestern Connecticut.

J. dichotomus Ell. Fairfield (Eames).

Juncus dichotomus Ell., var. platyphyllus Wiegand. Fairfield (Eames). Previously reported only from Groton.

* J. effusus L., var. conglomeratus Engelm. Gray Man. Ed. 5. 537 (1867). Rhodora, xii. 85. Rare. Sphagnous meadows: Voluntown (Bissell, Rhodora, xiii. 31), Franklin (R. W. Woodward, Rhodora, xii. 86).

* J. effusus L., var. decipiens Buchenau. Rare. Moist grassy roadside, Madison (Weatherby).

J. brachycephalus (Engelm.) Buchenau. In moist or dry calcareous soils southward in the Housatonic valley to New Milford and Sherman (Eames).

J. canadensis J. Gay, var. subcaudatus Engelm. Ledyard (Graves), Killingly (Bissell & Weatherby), Colebrook (M. L. Fernald). Eastern and western extensions of range.

* Uvularia grandiflora Smith. Rare. Low, rich woods, Salisbury (Mrs. J. R. Hubbard).

† Allium Schoenoprasum L. Chives. Rather freely spontaneous in waste ground near a garden, Middlebury (Harger). Fugitive from Europe.

Hosta japonica (Thunb.) Aschers. Bridgeport (Eames).

Hemerocallis flava L. Newtown and Danbury (Harger) and rare to occasional throughout southwestern Connecticut.

Lilium superbum L. Plainfield (Harger), Voluntown (Harger et. al.) and frequent southerly along the Quinebaug River.

Streptopus roseus Michx. Guilford (W. R. Dudley; specimen in Herb. Yale University). Extension of range southeastward.

* Dioscorea paniculata Michx., var. glabrifolia Bartlett. Bur. Pl. Industr. U. S. Dept. Agric. Bull. clxxxix. 17 (1910). "Middlesex Co." (S. B. Buckley, 1835), "New Haven Co." (Robbins). This variety, recently described as distinguishable from *D. paniculata* Michx. (*D. villosa* L.), differs only in having the leaves entirely glabrous.

† Gymnadenia conopsea R. Br. Litchfield (Miss Anna M. Vail, Bull. Torr. Bot. Club, xxxvii. 432). A single specimen in the Herbarium of the Torrey Botanical Club — the only known collection from North America. Miss Vail does not now remember just when nor where it was found. It may possibly have been introduced by some lover of flowers; and collectors should be on the lookout for it about Litchfield, that it may be, if possible, rediscovered and its status definitely made out.

Habenaria macrophylla Goldie. Colebrook (G. E. Nichols).

H. blephariglottis (Willd.) Torr. East Windsor (J. W. Robbins, 1825; specimen in Herb. Yale University), South Windsor, in great quantity in 1916 (C. W. Vibert), Suffield (Eames & C. C. Godfrey, C. W. Vibert).

Pogonia affinis Austin. Waterford (Miss Florence Griswold), Middletown (Miss G. H. Miner).

Spiranthes lucida (H. H. Eaton) Ames. Extends southward to Huntington on tidewater. (Eames) and Wilton (G. P. Ells).

S. Beckii × gracilis. Bridgeport (J. F. Moore. E. H. Eames, Rhodora, xviii. 239).

Epipactis repens (L.) Crantz, var. ophioides (Fernald) A. A. Eaton. Guilford (W. R. Dudley, 1904; specimen in Herb. Yale University). Not previously reported south of Southington.

E. TESSELATA (Lodd.) A. A. Eaton. Barkhamsted and Beacon Falls (A. E. Blewitt). The latter station a southward extension of range.

SALIX PENTANDRA L. Bridgeport (Eames), New Haven (A. E. Blewitt).

S. SERISSIMA (Bailey) Fernald. New Haven (J. A. Allen; specimen in Herb. Conn. Agr. Exp. Sta. RHODORA, xiv. 80). In the Catalogue reported only from the northwestern part of the state.

S. SUBSERICEA (Anders.) Schneider. Hartland (Bissell & Weatherby).

* S. ROSTRATA Richards., var. CAPREIFOLIA Fernald. RHODORA, xvi. 177 (1914). By a woodland path in rather wet ground, Barkhamsted (A. E. Blewitt).

* MYRICA GALE L., var. SUBGLABRA (Chevalier) Fernald. RHODORA, xvi. 167 (1914). This variety with the leaves glabrous or glabrate beneath is now known from Norwich (W. A. Setchell) and Salisbury (Weatherby), and probably occurs elsewhere.

BETULA LENTA L. A form which is somewhat intermediate between and possibly a hybrid of, this species and *B. lutea* has been described as *B. allegheniensis* Britton and is rare in the western part of the state (Eames).

† B. NIGRA L. Several young trees on reclaimed land at Bridgeport, where probably introduced (Eames).

QUERCUS MUHLENBERGII Engelm. Rocky hillside in Wilton (W. J. Comstock, G. P. Ells and H. W. Beers).

Q. RUBRA L., var. AMBIGUA (Michx.) Fernald. Oxford and Seymour (Harger), Cornwall (R. C. Benedict; specimen in Herb. N. Y. Bot. Gard.). Probably of wider distribution.

BROUSSONETIA PAPYRIFERA (L.) Vent. An additional station in Norwalk (Eames). Roadsides: Stamford and Greenwich (W. H. Hoyt).

RUMEX MEXICANUS Meisn. Old Lyme (Graves, A. E. Blewitt), Cheshire and Naugatuck (A. E. Blewitt), Salisbury (Mrs. C. S. Phelps, RHODORA, xvi. 96). Occasional in the southwestern part of the state (Eames).

R. ALTISSIMUS Wood. In the fresh green state the fruiting calyx commonly bears a uniformly large tubercle on each lobe; two of them shrinking but little more than the other until full maturity — a fact that has given cause for some confusion in field studies of this species. Occasional on banks and shores along tidewater of the Housatonic River (Eames).

Polygonum laphathifolium L., var. nodosum Meisn. Rare. Waste ground, Bridgeport (Eames).

P. acre, HBK., var. leptostachyum Meisn. Kent and New Milford (Eames). Frequent at Oxford (Harger).

*P. hydropiperoides Michx., var. strigosum Small. Rare. Border of Ponds: Voluntown (R. W. Woodward), Hartford (A. W. Driggs), Huntington (Harger).

P. dumetorum L. Reported from many stations and probably occasional in dry, rocky woods over much of the state.

Chenopodium glaucum L. Naugatuck (A. E. Blewitt), Danbury (Harger), North Canaan (M. L. Fernald), Salisbury (Eames & C. C. Godfrey). Occasional in southwestern Connecticut (Eames). Previously reported only from Bridgeport.

C. Boscianum Moq. Scotland and Salisbury (Weatherby).

C. leptophyllum Nutt. Haddam (C. M. Child; specimen in Herb. Wesleyan University). Waste ground, Waterbury (A. E. Blewitt).

† Spinacia oleracea Mill. Spinach. Rare in waste grounds: Stratford and Fairfield (Eames). Fugitive from Europe.

* Atriplex patula L., var. littoralis (L.) Gray. Sea-beaches: occasional in southeastern Connecticut (Graves), Fairfield (H. S. Clark), South Norwalk (Bissell), Greenwich (Eames & C. C. Godfrey). In the Catalogue included under typical *A. patula*.

Amaranthus spinosus L. Waterbury (A. E. Blewitt).

Acnida tuberculata Moq. Groton (Graves), Naugatuck (A. E. Blewitt), Bridgeport and Norwalk (Eames).

† Celosia cristata L. Rare in waste ground at Fairfield (Eames). Fugitive from the tropics.

Oxybaphus nyctagineus (Michx.) Sweet. Naugatuck and Waterbury (A. E. Blewitt). Well established in vacant lots at West Haven, Orange (Harger, Mrs. C. H. Lyman). Previously reported only from Granby.

O. hirsutus (Pursh) Sweet. Milford (Eames).

* Anychia polygonoides Raf. Rare. Grass-land, East Hartford (C. C. Hanmer). West Peak, Meriden (Miss Celia A. Shepard; specimen in Herb. Conn. Agr. Exp. Sta.).

* Spergularia canadensis (Pers.) G. Don. Groton (Bissell, Rhodora, xii. 162).

* S. salina J. & C. Presl. Groton (Bissell, l. c.).

S. leiosperma (Kindberg) F. Schmidt. Common in saline soil along

the coast. Discussion of this and the two preceding species will be found in Rhodora, xii. 157–162.

Sagina decumbens (Ell.) Torr. & Gray. Portland (A. E. Blewitt).

* Stellaria borealis Bigel., var. isophylla Fernald. Rhodora, xvi. 150 (1914). Cromwell and Winchester (Bissell), Guilford (G. H. Bartlett & Harger), Southington (Andrews), Oxford (Harger).

S. borealis Bigel., var. floribunda Fernald. Rhodora, xvi. 151 (1914). Orange (Weatherby), Oxford (Harger).

† S. graminea L., var. latifolia Peterm. East Hartford (Weatherby), Southington (Andrews), Salisbury (Bissell), Milford and Bridgeport (Eames). Introduced from Europe.

† S. aquatica L. Rare. Moist banks of the Housatonic River below highwater mark, sparingly at two stations (Harger). Fugitive or adventive from Europe.

* Silene antirrhina L., forma Deaneana Fernald. Rhodora, xvii. 96 (1915). Occasional in dry soil. Differs from the typical form in the entire absence of the glutinous band on the internodes.

† S. gallica L., var. quinquevulnera Koch. Rare. Cultivated fields, Southington (Andrews). Fugitive from Europe.

Gypsophila muralis L. Roadside, Chester (Graves).

Nuphar advena (Ait.) R. Br. Occasional in the coastal region of southwestern Connecticut (Eames).

N. variegatum Engelm. Common or occasional throughout. Recent studies have shown that the name *Nuphar advena* should be restricted to the larger plant having mostly emersed leaves with open sinus.

N. microphyllum (Pers.) Fernald. Rhodora, xix. 111 (1917). Guilford (W. R. Dudley; specimen in Herb. Yale University), Plymouth (H. J. Bassett, 1861), Stamford (Eames & C. C. Godfrey). In the Catalogue not reported from Fairfield Co.

Nymphaea tuberosa Paine. Rogers Pond, Old Lyme (Graves).

(*To be continued.*)

E. B. Harger,
C. B. Graves,
E. H. Eames,
C. H. Bissell,
L. Andrews,
C. A. Weatherby.

FURTHER NOTES ON THE ORCHIDS OF THE REGION OF ASQUAM LAKE.

John B. May, M. D.

I was very much interested in Mr. Lowenstein's paper in a recent Rhodora, on the Orchids of the Asquam Lake Region. I have spent five summers in that region, one year as a councillor at Camp Algonquin, the last three as the Director of Camp Winnetaska, a girls' camp on Little Squam Lake. While my particular interest has been ornithological rather than botanical, I have kept a careful list of the Orchids found in the region, and therefore submit the following notes.

Cypripedium parviflorum, two colonies, about twenty-five plants.

Habenaria dilatata, abundant in at least one station; probably two hundred plants in swamp near Red Hill.

H. macrophylla, two plants at Camp Winnetaska, 1915.

H. blephariglottis, one station in 1903, since drained and cultivated.

Pogonia ophioglossoides, abundant in several swamps.

Arethusa bulbosa, abundant in one swamp near Red Hill, brought to me by Mrs. Frank Low of Worcester, Mass.

Liparis Loeselii; this I believe is an incorrect record. I found a small colony beside the Winnepesaukee River in Tilton, N. H., in 1913, while on a canoe trip with Algonquin boys. It was credited to the Algonquin list, but was well outside the Asquam Lake Region. I know of no other records.

Orchis spectabilis, a small colony near Little Squam in 1914. Seven plants flowered, 1916.

Microstylis unifolia, no records, 1913, 1914. Several, 1915, common, 1916. This I believe due to the peculiar weather conditions the last two summers, rather than more careful observation, as I was looking for this plant especially, in 1913.

I agree with Mr. Lowenstein's notes of the remaining species, all of which I have found with the exception of *Listera cordata*. The abundance of *Pogonia trianthophora* in 1916 is most unusual, I believe, the plants being very locally found, near Camp Algonquin.

Cohasset, Massachusetts.

Tiarella cordifolia L., forma **parviflora**, n. f., a forma typica recedit petalis 2–3 mm. longis lineari-lanceolatis vel anguste oblanceolatis; filamentis maturis 1.5–3 mm. longis.

Differing from the typical form in having the linear-lanceolate or narrowly oblanceolate petals 2–3 mm. long, and the mature filaments 1.5–3 mm. long.— Massachusetts: forming a large colony on the wooded bank of the Boston and Albany Railroad, east of the station, Becket, May 31, 1915, *M. L. Fernald*, no. 15,172 (type in Gray Herb.).

Very obvious in the field on account of its small flowers; typical *T. cordifolia* having the broader petals 4–6 mm. long and the mature filaments 4–7 mm. long. In all other respects the Becket colony of forma *parviflora* is like the abundant large-flowered plant of the region: the petals are entire and there is no indication that it belongs in the series of specimens which seem to be hybrids between *Mitella diphylla* and *Tiarella cordifolia*, in which the petals are usually toothed.[1] — M. L. Fernald, Gray Herbarium.

Some further Plants found on Woolwaste at Westford, Massachusetts.— During the past summer I have continued to note the unusual plants that have sprung up on land at Westford which has been fertilized with a dressing of woolwaste. Four, which were unfamiliar, have been found and taken to the Gray Herbarium, where they have been identified for me by Dr. Robinson, Dr. S. F. Blake, and Mr. J. F. Macbride. They have been as follows: *Sida spinosa* L. and *Erodium moschatum* (L.) L'Hér., both of which I am told are not infrequent as casual introductions in waste places and dumping grounds about cities. *Malvastrum coromandelianum* (L.) Garcke, generally known as *M. tricuspidatum* Gray, a plant of our southern states and occasionally found as a ballast weed in the middle Atlantic states, though not recorded north of New Jersey. And *Erodium Stephanianum* Willd., an Asiatic species, rather widely distributed from the Caucasus region to southern China, but not hitherto reported in America even as an introduction.— Emily F. Fletcher, Westford, Massachusetts.

[1] See Rhodora, viii. 91 (1906).

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—NEW SERIES, NO. L.

M. L. Fernald.

I. SOME POLYGONUMS NEW TO NORTH AMERICA.

Polygonum laxiflorum Weihe. In September, 1916, Mr. Bayard Long and the writer noticed in a roadside ditch at Bowdoinham, Maine, a *Polygonum* which had much the habit of *P. Hydropiper* L., with which it was growing, but which differed at first glance in its much deeper rose-colored or crimson flowers and somewhat broader leaves. Specimens were collected and upon study the plant proves to be *P. laxiflorum* Weihe, Flora, ix. 746 (1826), the plant which is frequently found in herbaria under the name *P. mite* Schrank. *P. mite*, however, according to Moss [1] is synonymous with *P. minus* Huds. So far as the writer can determine by close examination of all the material in the Gray Herbarium and the herbarium of the New England Botanical Club, *P. laxiflorum* has not heretofore been collected in America, but its abundance in the ditch at Bowdoinham indicates its thorough establishment there and the likelihood that, with attention especially directed to the plant, it will soon be found to be somewhat widely distributed with us. The plant, as above stated, resembles *P. Hydropiper* but has deeper-colored flowers; and it is at once separated by the fact that its perianth is strictly glandless and its achene smooth and lustrous, the perianth of *P. Hydropiper* being glandular-dotted and the achene punctate and opaque or dull.

[1] Moss, Camb. Brit. Fl. ii. 121 (1914).

Polygonum minus Huds. Fl. Angl. 148 (1762). This delicate species, closely related to *P. laxiflorum* above discussed, is not generally recognized as a North American plant but in the Gray Herbarium are two sheets from Lancaster County, Pennsylvania, which are clearly referable to it. The first collection was made on October 31, 1891, by Heller & Small in Smithville Swamp No. 2 and distributed by Heller as no. 652, *P. acre* HBK. The other collection was made by Mr. Heller on September 23, 1901, in a swamp two miles south of Refton and distributed as *P. punctatum*, var. *leptostachyum* (Meisner) Small. *P. minus* is a very slender species with glabrous perianths and lustrous achenes, much as in *P. laxiflorum* but very much smaller, the achenes only 1.5 mm. long, those of *P. laxiflorum* being 3 mm. long. The Lancaster County material exactly matches the plate in the Moss's *Cambridge British Flora* designated *P. minus*, var. *subcontiguum*, which is there ascribed to Wallich, Pl. Asiat. Rar. iii. 57 (1832). But Wallich neither published the plant under *P. minus* nor as var. *subcontiguum*, and in fact the treatment in Wallich's work was by Meisner. The variety was published as *P. strictum* All., var. *subcontinuum*. As a variety of *P. minus* it should be called

Polygonum minus Huds., var. **subcontinuum** (Meisn.), n. comb. *P. strictum*, var. *subcontinuum* Meisn. in Wallich, Pl. Asiat. Rar. iii. 57 (1832). *P. mite* * *strictum*, *b. pusillum* Fries, Fl. Suec. Mant. ii. 32 (1839). *P. minus*, var. *subcontiguum* Rouy, Fl. Fr. xii. 102 (1910.)— In this variety the spikes are very straight (not curving or drooping) and closely flowered, ranging in length from 1–2 cm.

Polygonum sagittatum L., forma **chloranthum**, n. f.— perianthiis viridibus.

Perianths green.— Maine: tidal mud-flats of Cathance River, Bowdoinham, September 14 & 19, 1916, *Fernald & Long*, no. 13,559 (type in Gray Herb.).

Throughout its range both in America and in Asia *P. sagittatum* normally has the flowers pink,— either deep rose-color or pale pink — or sometimes nearly white, but on the tidal flats of Cathance River the green-flowered form is very abundant and so uniform as to give a distinctive color to large areas of the flats. The plant is there so constantly green-flowered that it deserves at least formal recognition. The material gathered on September 19 was still in young flowering condition and in only a few heads are the achenes well formed. It is possible that the plant growing in this estuary, subject to regular

inundations, may be much less fertile than the ordinary pink-flowered plant of less inundated situations. That it has not completely lost its fertility, however, is shown by good achenes which are found in a few heads.

II. NEW OR CRITICAL SPECIES OR VARIETIES OF RANUNCULUS.

RANUNCULUS PURSHII Richardson, var. **prolificus**, n. var., ramis valde adscendentibus 7–50-floris; foliis bracteiformibus simplicibus vel subsimplicibus numerosissimis, inferioribus 1–4 cm. longis.

Branches strongly ascending, 7–50-flowered: the simple or subsimple bracteal leaves numerous; the lower 1–4 cm. long.— MAGDALEN ISLANDS: wet meadow, Grindstone, July 22, 1912, *Fernald, Bartram, Long & St. John*, no. 7482 (TYPE in Gray Herb.).

Similar specimens referred in the herbarium sometimes to *R. Purshii*, sometimes to *R. sceleratus*, and by some collectors suggested as a hybrid of these two species, have been examined from Michigan and Montana. On the Magdalen Islands, where this plant forms a characteristic large colony in a meadow, no *R. sceleratus* has been found; and the plant there seems to be a definite, though extreme, variation from *R. Purshii*. In the typical form of the species the branches are prostrate or only slightly ascending and bear only 1–4 flowers, and the simple or subsimple bracteal leaves, when present, are rarely more than one or two in number and very small.

RANUNCULUS FLAMMULA AND R. REPTANS IN NORTH AMERICA.— Although often treated as a variety of *Ranunculus Flammula* L., *R. reptans* L. seems to merit recognition as a species. It is of general distribution in boreal regions, while *R. Flammula* of temperate Eurasia is known in North America only from southeastern Newfoundland, where it is associated with many other typical western European species unknown elsewhere in North America, and on the Pacific slope from southern British Columbia to California. Slender extremes of *R. Flammula* and the coarsest extremes of *R. reptans* somewhat simulate one another but all so-called transitional material seen by the writer is definitely referable to one or the other species in its floral characters and entirely consistent in geographic range. The usually stout ascending or merely trailing *R. Flammula* of Europe, Newfound-

land, and Pacific North America has the inflorescence, when well developed, a loose corymbose cyme with 2–30 flowers; the sepals are 3–4 mm. long; the broadly obovate or roundish petals 4–7 mm. long, 4–7 mm. broad, sessile or nearly so, 9–13-nerved; stamens 25–50; carpels 25–50, forming globose fruiting heads 3.5–5 mm. long; and the achenes are merely short-tipped. The slender, ordinarily filiform and repent branches of *R. reptans*, on the other hand, bear solitary flowers; the sepals are 2–2.8 mm. long; the petals narrowly obovate to oblong, 2.5–5 mm. long, 1–3 mm. broad, usually with a definite claw, 3–9-nerved; stamens 10–20; carpels 15–20, forming a hemispherical or spherical fruiting head 1.5–3 mm. long; and the achenes are distinctly beaked.

R. Flammula, var. *intermedius* Hook. has long passed as a plant transitional between *R. Flammula* and *R. reptans*, and in recent years it has been made to include very diverse elements. Thus, in the *Synoptical Flora* it is said to be the same as *R. Flammula*, var. *unalaschcensis* Ledeb., to have "akenes of the type or more beaked," and to occur from "Shore of Lake Ontario [1] to California and Oregon and northward. (N. Asia, Eu.) Largest forms from western coast, nearly approaching the type; very slender and linear-leaved as well as small broader-leaved forms pass into **Var. reptans**, E. Meyer." [2] Examination of the material upon which this statement was based shows that the Lake Ontario plant, the "very slender and linear-leaved" form, has the floral and achenial characters of *R. reptans;* the Newfoundland plant of Robinson & Schrenk is typical *R. Flammula;* and the California and Oregon material examined by Gray, the "largest forms from western coast", has the flowers and fruit, likewise, of *R. Flammula*. This variety, thus made up of elements belonging on the one hand to *R. Flammula*, on the other to *R. reptans*, was naturally described by Gray, as having "akenes of the type or more beaked." The status of this very mixed variety was well characterized in the 7th edition of Gray's *Manual*, where *R. Flammula* was said to pass "through an undefinable var. INTERMEDIUS Hook., into var. **reptans**." [3]

It is quite certain that, when he published his *R. Flammula*, var. *intermedius* [published as *intermedia*], Hooker had no thought of including the *R. Flammula* of the Pacific slope, for he distinctly wrote: "It does not appear that any of the varieties are found on the Rocky

"[1] Eastward to St. John's, Newfoundland, *Robinson & Schrenk*," etc.

[2] Gray, Syn. Fl. 1. pt. 1, 26, 27 (1895).

[3] Robinson & Fernald in Gray, Man. ed. 7, 395 (1908).

Mountains, nor to the westward of them."[1] Hooker had three varieties of *R. Flammula:* α *major* which is the endemic American *R. laxicaulis* (T. & G.) Darby; "β. *intermedia;* caule repente gracili, foliis anguste lanceolatis superioribus linearibus integerrimis"; and γ *filiformis*, which was typical *R. reptans* L. The two latter, vars. *intermedius* and *filiformis*, he had from "gravelly banks of rivers from Canada to lat. 69°." Thus it is clear that Hooker was merely separating from the true slender-leaved *R. reptans* (his *R. Flammula* γ *filiformis*) a broader-leaved but repent slender plant of Canadian river banks, a plant scarcely separable from *R. reptans*, but somewhat broader-leaved than the typical form of the species.

Similarly the name *R. Flammula*, var. *unalaschcensis* (Bess.) Ledeb. has been taken up for the western form of *R. Flammula*, but in the Gray Herbarium, where there are several sheets from the Aleutian Islands, there is none which is not clearly referable to *R. reptans*, either narrow- or broad-leaved. The only description of var. *unalaschcensis* was in Flora Rossica and there is nothing in it to indicate that it is more than an extreme of *R. reptans*. Ledebour recognized true *R. reptans* with filiform or filiform-linear leaves as *R. Flammula* γ and contrasted with it a var. "β. caule prostrato radicante, foliis latioribus integerrimis, rarius unidentalis" which included "*R. unalaschcensis*, Besser in *herb. Zeyheri.*"[2] This, judging from various specimens from Unalaska and the other Aleutian Islands, was, then, a form of *R. reptans*. This broad-leaved extreme of *R. reptans* is

R. REPTANS, var. OVALIS (Bigel.) T. & G. Fl. N. A. i. 16 (1838). *R. filiformis*, var. β. *ovalis* Bigel. Fl. Bost. ed. 2, 224 (1824). *R. unalaschcensis* Bess. in Ledeb. Fl. Ross. i. 32, as syn. (1841). *R. Flammula*, var. *unalaschcensis* (Bess.) Ledeb. acc. to Regel, Bull. Soc. Nat. Mosc. xxxiv. pt. 2, 41 (1861). *R. reptans*, var. *strigulosus* Freyn, Deutsche Bot. Monatschr. viii. 181 (1890).

RANUNCULUS PYGMAEUS Wahlenb., var. **petiolulatus**, n. var., foliis radicalibus pedatim divisis, foliolis 3 petiolulatis rhomboideo-obovatis palmatis laciniis 3–5 oblongis vel valde divisis; capitulis fructiferis 5–7.5 mm. longis.

Radical leaves pedately divided; the 3 leaflets petiolulate, rhombic-obovate, palmate, with 3–5 oblong lobes or deeply divided: fruiting heads 5–7.5 mm. long.— QUEBEC: damp mossy hollows in shade of amphibolite rocks, altitude 950–1000 m., Mt. Albert, Gaspé County, August 8 & 10, 1905, *Collins & Fernald*, no. 82 in large part (TYPE in Gray Herb.).

[1] Hook. Fl. Bor.-Am. i. 11 (1829).
[2] Ledeb. Fl. Ross. i. 32 (1842).

Typical *R. pygmaeus* of the Arctic regions, Labrador and the Canadian Rocky Mountains has the basal leaves merely lobed, not divided to the base, and the fruiting heads are 3–5 mm. long. In its basal leaves var. *petiolulatus* is quite like the rare Rocky Mountain species, *R. Grayi* Britton, but it has the small petals and achenes of *R. pygmaeus*. On Mt. Albert collections were made on two days at different points and all the material distributed under one number. The full sheet retained at the Gray Herbarium contains a few plants of true *R. pygmaeus*, but most of the specimens (presumably from a different station) are the variety.

Ranunculus pedatifidus J. E. Sm., var. **leiocarpus** (Trautv.), n. comb. *R. affinis* R. Br. in Parry, 1st Voy. Suppl. App. 265 (1824). *R. affinis*, var. *leiocarpa* Trautv. in Middendorf, Reise in Sibir. i. 62 (1847).

All the material seen by the writer from Arctic America, the Labrador Peninsula, and the Hudson Bay region, including a duplicate type of *R. affinis* from Melville Island, has glabrous achenes and characteristic pedately many-cleft basal leaves. In the Rocky Mountain region this plant is rare, the common plants there being true *R. pedatifidus*, with pedately cleft basal leaves and pubescent achenes, and var. *cardiophyllus* (Hook) Britton,[1] with the basal leaves mostly uncleft and merely crenate or dentate. In Siberia, too, there are apparently large areas where only the glabrous-fruited variety is found. This, at least, is indicated by Trautvetter's note: "In speciminibus taimyrensibus omnibus Ranunculi affinis R. Br. ovaria prorsus glabra sunt; attamen in herbario horti botanici Petropolitani inter specimina daurica ejusdem speciei nonnulla inveni, in quibus carpella aeque pilis prorsus carent."

Ranunculus repens L., var. **plenifiorus**, n. var., foliis basilaribus ternatis, foliolis suborbicularibus basi rotundatis vel subcordatis margine crenatis vel late obtuseque dentatis; floribus plenis.

Basal leaves ternate; the suborbicular leaflets rounded or subcordate at base, the margin crenate or with broad obtuse teeth: flowers double.— Frequent in old gardens, and tending to become naturalized in meadows, roadside-ditches, etc. Type: well established in meadows and along roadsides, Oneida, Herkimer County, New York, May 30, 1900, *J. V. Haberer*, no. 1530 in Gray Herb.

[1] Records of this plant from Quebec and Labrador seem to have been based on *R. Allenii* Robinson, Rhodora, vii. 220 (1905).

This plant is generally called in horticulture *R. repens*, var. *flore-pleno* but the latter name (if it can be accepted as a valid name) belongs to the double-flowered European form of *R. repens* with the bases of the leaflets cuneate to subtruncate, as in true *R. repens*, and the teeth and segments elongate and subacute to acuminate. The history of var. *pleniflorus* is obscure. It is found in old gardens and as a somewhat naturalized weed in eastern America; but such illustrations of the double-flowered *R. repens* of Europe as the writer has seen, as far back as Gerard's *Herball* (ed Johnson, 1633), where the plant is figured as *Ranunculus dulcis, multiplex,* and Besler's *Hortus Eystettensis* (1613) where it is called *Ranunculus hortensis, multiflorus*, show the characteristically cuneate-based leaflets of *R. repens*.

III. SOME COLOR FORMS OF AMERICAN ANEMONES.

Anemone riparia Fernald. This northern riverbank and shore species differs constantly from the more southern *A. virginiana* in several characters as well as its northern range and very early flowering season (from May to July). Contrasted with *A. virginiana* it has the leaf-segments usually more cuneate at base, although this character is by no means absolute; anthers 0.7–1.2 mm. long, those of the more southern *A. virginiana* running from 1.2–1.6 mm. long; its fruiting head 7–11 mm. thick, as contrasted with *A. virginiana* in which the heads are 1.2–1.5 cm. thick; and the subulate pale styles ascending or subascending in fruit, as contrasted with the firmer, more divergent styles of *A. virginiana*. The two species are sometimes confused in flower owing to the fact that each presents a distinctly sepaloid or a pronouncedly petaloid perianth. *A. riparia*, in fact, appears in three well pronounced forms as follows:

A. riparia Fernald, Rhodora, i. 51, t. 3. (1899), typical form.— Sepals petaloid, white; at least the inner broadly oblong to oval, with rounded tips, 1.3–2 cm. long, 0.8–1.5 cm. broad.— Calcareous or slaty ledges, rarely in swamps, Gaspé County, Quebec, to British Columbia, south to Cape Breton and Pictou County, Nova Scotia, King's County, New Brunswick, central Maine, Franklin County, Massachusetts, northern Fairfield County, Connecticut, Sullivan and Tompkins Counties, New York, northern Illinois, Minnesota, etc.— Flowers late May to July.

Forma **rhodantha**, sepalis rubris.

Sepals bright red.— QUEBEC: gravelly banks of the Grand River, Gaspé County, July, 1902, *George H. Richards* (TYPE in Gray Herb.).

Forma **inconspicua**, n. f., sepalis crassis coreaceis viridescentibus vel ochroleucis oblongo-acuminatis 0.7–1.3 cm. longis 2.5–5 mm. latis.

Sepals thick and leathery, greenish or greenish-white, oblong-acuminate, 0.7–1.3 cm. long, 2.5–5 mm. broad.— Range of the species, less common. As TYPE may be cited the sheet in the Gray Herbarium collected on cold walls of Percé Mountain, Percé, Gaspé County, Quebec, July 25, 1905, by *Williams, Collins & Fernald.*

ANEMONE VIRGINIANA L. As stated in the discussion of *A. riparia*, that species and *A. virginiana* are often confused through the fact that in both species either leathery greenish sepals or thin petaloid white sepals occur. In typical *A. virginiana* the sepals are leathery and greenish, the form with thin petaloid white sepals being comparatively rare. These two forms may be separated as follows:

A. VIRGINIANA L. Sp. Pl. i. 540 (1753), typical form.— Sepals leathery, greenish or greenish-yellow, very pubescent on the back, narrowly oblong, acuminate, 0.7–1.3 cm. long.— Dry slopes, dry or rocky open woods, or occasionally in meadows, common in the southeastern United States extending northward to Lakes Erie and Ontario and the lower Ottawa River, Ontario, Hochelaga County and Lake Memphremagog, Quebec, southern Coös County, New Hampshire, and Oxford and southern Penobscot Counties, Maine.— Flowers late June to late August.

Forma **leucosepala**, n. f., sepalis tenuibus albis petaloideis, majoribus vix pubescentibus obovatis apice rotundatis 1.2–1.7 cm. longis.

Sepals thinnish and petaloid, white; the larger ones scarcely pubescent on the back, obovate, rounded above, 1.2–1.7 cm. long.— Less common than the typical form. As TYPE specimen may be designated the plant collected on the north bank of the Swannanoa River near Biltmore, North Carolina, June 28 and August 9, 1897, and distributed from the *Biltmore Herbarium* as no. 54b (in Gray Herb.).

ANEMONE MULTIFIDA Poir. *Anemone multifida* as it occurs in North America seems to be conspecific but not strictly identical in all details with the Patagonian and Chilean type of the species, although some Rocky Mountain specimens seem scarcely separable from the South American. The plant in eastern America is extremely variable and falls rather clearly into two pronounced varieties, each of which presents noteworthy forms. These eastern American variants of the species may be separated as follows:

Sepals 5–10 mm. long: flowering stem 0.5–3 dm. high, 1–3-flowered.
Sepals yellowish-white within, yellowish, greenish or dull purplish outside, usually 5 ..... var. *hudsoniana*.
Sepals bright-red.
Sepals 5 ..... forma *sanguinea*.
Sepals very numerous (14–16) ..... forma *polysepala*.
Sepals 1.1–1.7 cm. long, usually 5 in number: flowering stem (1.5–) 3–7 dm. high, 1–5-flowered.
Sepals bright-red ..... var. *Richardsiana*.
Sepals milk-white ..... forma *leucantha*.

Var. HUDSONIANA DC. Syst. i. 209 (1817?). *A. Hudsoniana* Richardson in Franklin's Journ. 741 (1823).— Dryish slaty or calcareous ridges and gravel, local, eastern Newfoundland and Anticosti Island to the shores of Hudson Bay and westward, locally southward to Baie des Chaleurs, Quebec, Restigouche River, New Brunswick, St. John River and tributaries, New Brunswick and Maine, and Winooski River, Vermont.

Var. HUDSONIANA, forma **sanguinea** (Pursh), n. comb. *A. Hudsoniana β. Sanguinea* Richardson in Franklin's Journ. 741 (1823) based upon *A. sanguinea* Pursh ined. in herb. Lamb.— Of similar range, often more common.

Var. HUDSONIANA, forma **polysepala**, n. f., sepalis 14–16 — QUEBEC: banks of the Grand River, Gaspé County, June 20–July 10, 1903, *George H. Richards* (TYPE in Gray Herb.).

Var. **Richardsiana**, n. var., sepalis 1.1–1.7 cm. longis rubris saepissime 5; caulibus floriferis 3–7 dm. altis 1–5-floris.— QUEBEC: gravelly banks of the Grand River, Gaspé County, June 20–July 10, 1903, *George H. Richards* (TYPE in Gray Herb.), June 30–July 3, 1904, *M. L. Fernald;* banks of Restigouche River, Matapedia, June 28, 1904, *M. L. Fernald.*

Var. RICHARDSIANA, forma **leucantha**, n. f., sepalis lacteis.— QUEBEC: with the typical form, banks of the Grand River, Gaspé County, June 30–July 3, 1904, *M. L. Fernald* (TYPE in Gray Herb.).

IV. NEW SPECIES, VARIETIES AND FORMS OF SAXIFRAGA.

Saxifraga gaspensis, n. sp. *S. nivalem* simulans, differt foliis basilaribus angustioribus cuneato-obovatis basi angustatis subpetiolatis, apice acutis acute dentatis, 1.5–3 cm. longis 5–9 mm. latis; scapo gracile 1–7 cm. alto minute glanduloso-piloso; inflorescentia spicato-racemosa maturitate 1–2.7 cm. longa 3–5-flora; bracteis inferioribus oblongis vel ovatis acutis 5–8 mm. longis flores superantibus; pedicellis 2–3 mm. longis pilosis; tubo calycis viride hemisphaerico 1.5–2.5 mm. alto, lobis calycis oblongis vel anguste deltoideis fructu reflexis 1.8–2 mm. longis; petalis albis lanceolatis vel anguste ellipticis acutis vel subacutis 1.5–2 mm. longis 0.5–0.8 mm. latis; filamentis filiformibus subulatis purpurascentibus 1–1.2 mm. longis;

capsulis viridescentibus vel pallide brunneis 4 mm. longis, rostris foliculorum perbrevibus divergentibus.

Resembling *S. nivalis*, but the rosette-leaves more narrowly cuneate-obovate and more gradually narrowed to the broad petiolar base, acute at summit, 1.5–3 cm. long, 5–9 mm. broad, acutely dentate above the long-cuneate base: scape solitary, slender, 1–7 cm. high, minutely glandular-pilose: inflorescence spicate-racemose, in fruit 1–2.7 cm. long, 3–5-flowered: lower bracts oblong or ovate, acute, 5–8 mm. long, exceeding the flowers: pedicels 2–3 mm. long, pilose: calyx-tube green, hemispherical, 1.5–2.5 mm. high; calyx-lobes oblong or narrowly deltoid, reflexed in fruit, 1.8–2 mm. long; petals white, lanceolate or narrowly elliptical, acute or subacute, 1.5–2 mm. long, 0.5–0.8 mm. wide: filaments filiform-subulate, purplish, 1–1.2 mm. long: capsules greenish or pale-brown, 4 mm. long; the follicles with very short divergent beaks.— QUEBEC: very local, in sheltered pockets on abrupt western calcareous slopes, altitude 1000–1100 meters, Table-top Mountain, Gaspé County, August 5 and 12, 1906, *Fernald & Collins*, no. 600 (TYPE in Gray Herb.).

Distributed as *S. nivalis*, from which it differs in many characters; *S. nivalis* having the leaves more rounded-oblong to round-obovate and narrowed to a more definite petiole and commonly much broader (0.7–3 cm.). The inflorescence of *S. nivalis* is usually more numerously flowered, varying from spiciform to corymbiform; its calyx-lobes are from 2–3 mm. long, spreading in fruit; its oblong petals are rounded at summit and 1.5–2.3 mm. wide; and its capsule is much larger, 5–7.5 mm. long. On Table-top Mountain the extremely local *S. gaspensis* was growing with other very localized species, *Carex rupestris* Allioni, *Pyrola grandiflora* Radius, *Pedicularis flammea* L., *Campanula uniflora* L. and *Senecio pauciflorus* Pursh.

SAXIFRAGA NIVALIS L., var. **labradorica**, n. var., panicula corymbiformi laxa; floribus plerumque graciliter pedicellatis, pedicellis 3–10 mm. longis.

Panicle loosely corymbiform; the flowers mostly on slender pedicels 3–10 mm. long.— LABRADOR: Rama, August 20–24, 1897, *J. D. Sornborger*, no. 57 in part (TYPE in Gray Herb.).

This is apparently the plant intended by Small in the *North American Flora* as *Micranthes tenuis*,[1] based upon *Saxifraga nivalis β. tenuis* Wahlenb. Fl. Lap. 114 (1812). Wahlenberg's variety went back to earlier species of Rottboel and of Martens which prove to be merely forms of *S. nivalis* in which the lower branch of the inflorescence is

[1] Small, N. A. Fl. xxii. 136 (1905).

slightly elongate, but the flowers, as in *S. nivalis*, are sessile or subsessile in glomerules and not slenderly pedicelled as in var. *labradorica*.

SAXIFRAGA VIRGINIENSIS Michx. In Essex County, Massachusetts, this species seems peculiarly subject to minor variations, four fairly distinguishable forms of the species there being found. In typical *S. virginiensis* the petals are white and the flowers and fruits pedicelled, the cymose branches of the panicle elongating in fruit. In the town of Andover, however, a singular form of the plant occurs; in fact, the only collections (3 in number) seen from Andover all belong to this peculiar form which may be called

S. VIRGINIENSIS, forma **glomerulata**, n. f., floribus sessilibus in glomerulis dispositis.

Flowers sessile in glomerules at tips of the branches.— MASSACHUSETTS: Andover, 1901, *A. S. Pease*, no. 672; ledges, Rabbit Rock Pond, Andover, April 27, 1902, *A. S. Pease*, no. 673; Prospect Hill, Andover, May 24, 1902, *A. S. Pease*, no. 671 (TYPE in Herb. New England Botanical Club).

In its sessile flowers borne in glomerules at the tips of the branches this singular form from Andover strongly suggests *S. nivalis* and by ordinary treatments of the genus in which *S. nivalis* is separated chiefly by its sessile flowers the Andover plant would fall readily into that species. *S. virginiensis* is distinguished, however, from *S. nivalis* by a number of characters which have not always been clearly recognized. In *S. nivalis* the bracts are from one-half to fully as long as the branches of the inflorescence; the calyx-lobes spreading in fruit; the petals 1.5–3.5 mm. long, about equaling or only slightly exceeding the calyx-lobes. In *S. virginiensis*, on the other hand, the bracts are many times shorter than the branches of the inflorescences; the calyx-lobes ascend in fruit; and the petals in the normal forms of the species are 4–5.5 mm. long, 2–3 times as long as the calyx-lobes.

Some aberrant forms of *S. virginiensis*, however, occur with the petals very small or wanting. These plants, of which two have been described as varieties, are not, however, varietal in character, seeming to occur merely as aberrant colonies within the range of the typical *S. virginiensis* and they should be treated rather as forms. The first is

S. VIRGINIENSIS, forma **chlorantha** (Oakes), n. comb. *S. virginiensis*, var. *chlorantha* Oakes in Hovey's Mag. xiii. 218 (1847), described as follows: "Petals pale green, instead of snow white, as in

the common variety. The margins and backs of the petals are also sprinkled with short hairs like those of the rest of the plant, but paler, and not so uniformly glandular. Topsfield, Mass., 1842."

The other variation was described from Manhattan Island, New York, but has been collected by the late J. H. Sears in Essex County, Massachusetts, at a station where the plant is said to be abundant. This is

S. VIRGINIENSIS, forma **pentadecandra** (Sterns), n. comb. *S. virginiensis*, var. *pentadecandra* Sterns, Bull. Torr. Bot. Club, xiv. 124 (1887) and xv. 166 (1888).— Petals replaced by stamens; the latter 15.— Originally described from Manhattan Island, New York, where the plant was extremely scarce; found in profusion on garnet slate rock between White's and Perkins's Hills, Essex County, Massachusetts, by *J. H. Sears*, May, 1898.

SAXIFRAGA PENSYLVANICA L., forma **fultior**, n. f., bracteis inferioribus dilatatis ovalibus 7–10 cm. longis 4–5.7 cm. latis.

Lower bracts dilated, oval, 7–12 cm. long, 4–5.7 cm. wide.— NEW HAMPSHIRE: bog on Gap Mountain road, Jaffrey, May 30, 1899, *E. F. Williams* (TYPE in Herb. New England Botanical Club); brookside, Fitzwilliam road, Jaffrey, May 30, 1899, *Rand & Robinson*, no. 826.

In typical *S. pensylvanica* the lower bracts are slender and many times shorter than the mature branches of the panicle, but in this extreme form from Jaffrey these dilated oval bracts are from one-half to two-thirds as long as the mature branches of the panicle and render the plant quite different in appearance from the typical almost naked-stemmed form.

V. A NEW VITIS FROM NEW ENGLAND.

For many years the writer has been familiar with a wild grape of the Penobscot Valley in Maine which it has been impossible satisfactorily to place with any of the defined species. An entirely similar vine from various other river valleys of northern and western New England has been collected and deposited in either the Gray Herbarium or the herbarium of the New England Botanical Club and from time to time these plants have been labeled by the great specialist upon American grapes, the late T. V. Munson, or by Prof. L. H. Bailey as *Vitis Labrusca* × *vulpina*. The vines in many ways are quite intermediate between the two species, *V. Labrusca* L. and *V. vulpina* L., having

the green foliage of the latter, the leaf-contour nearly of the former, the tendrils and inflorescences often continuous (that is, several in succession before an interruption) as in *V. Labrusca*, the grapes large as in the latter species but with the clear acid flavor without "muskiness" as in *V. vulpina*. The seed of this grape is quite as large as in *V. Labrusca* but somewhat more slender.

The disposition of this plant as a hybrid between *V. vulpina* and *V. Labrusca* has never been satisfactory to the present writer for the very practical reason that the intermediate vine occurs in great profusion as a river-thicket vine, climbing high over the trees of the alluvial banks, in river valleys where no plants of either of the supposed parent have ever been detected. In Maine *V. Labrusca* is confined to the coastal strip eastward to Penobscot Bay (and there very rare and local), extending inland to the Saco and lower Androscoggin Valleys. *V. vulpina*, on the other hand, is an extremely rare vine in Maine. It occurs from the mouth of the Aroostook River southward along the St. John in New Brunswick and is presumably found along the Aroostook River across the border in Maine. It is found in the valley of the Piscataquis (southeast of Moosehead Lake), in the valley of the Sandy River (southeast of the Rangely Lakes) and locally in the Androscoggin Valley and southward into York County. North of Maine it extends to Lake St. John and thence westward to the Rocky Mountains and it is broadly distributed from western New England southwestward.

The intermediate vine, as demonstrated by careful botanizing in the valleys of the St. John, Penobscot, Kennebec and some of the minor rivers of Maine during the summer of 1916 by Mr. Long and the writer, is the characteristic grape-vine in alluvial thickets throughout central and west-central Maine where no *V. Labrusca* is found and where no *V. vulpina* has been observed. It is a locally abundant vine along the main Penobscot northward as far as northern Penobscot County, along the Kennebec northward nearly to Moosehead Lake, along the Androscoggin into Coös County, New Hampshire, where, I am informed by Dr. A. S. Pease, no *V. Labrusca* is known; and the Gray Herbarium and the herbarium of the New England Botanical Club show characteristic specimens from southwestern Maine and northeastern Massachusetts and from the Connecticut Valley of New Hampshire, Massachusetts, and northern Connecticut.

Only in this latter valley and in the region from southern Maine

to eastern Massachusetts do all three species generally occur and it is quite possible that here the intermediate plant is of hybrid origin; but the specimens cited below from these regions are so exactly like those from central Maine, where the plant is the one wild grape of the river valleys and where it cannot readily be accounted for as a hybrid at least of recent origin, that the writer feels that the intermediate plant should be given specific recognition. Even though it may have been of hybrid origin in the long-distant past it has now become a thoroughly fixed and constant vine through a considerable area and demands the same recognition that is given other species of similarly intermediate characters but distinct ranges, such for instance as *V. Treleasei* Munson. The vine may be appropriately called

Vitis **novae-angliae**, n. sp., ab *V. vulpina* differt foliis rotundatis vel reniformi-ovatis obsolete 3-lobatis (dentibus late deltoideis vix prolongatis) subtus pilosis vel arachnoideis subglabratis vel ad nervos pilosis vel arachnoideis junioribus tomentosis tomento plus minusve rufescento; pampinis thyrsisque 2–8 continuis vel interruptis; baccis oblatis maturitate atropurpureis glaucis 1.2–1.7 cm. diametro; seminibus 6–7 mm. longis.

Differing from *V. vulpina* in having the leaves round or reniform-ovate, obscurely 3-lobed and with broad scarcely prolonged deltoid teeth, pilose, arachnoid or subglabrate beneath or with some pubescence persistent along the nerves; the young more or less rufescent-tomentose: tendrils and inflorescences 2–8, continuous or interrupted: berries oblate, in maturity black-purple, glaucous, 1.2–1.7 cm. in diameter: seeds 6–7 mm. long.— Alluvial or rich thickets, Maine and New Hampshire to Connecticut. Types collected in river-thicket by the Penobscot, Orono, Maine, June 27, 1906, in flower, *M. L. Fernald;* August 17, 1908, in well grown fruit, *M. L. Fernald;* and in late September, 1908, mature fruit, *Margaret Fernald Pierce* (all in Gray Herb.). Other specimens examined. Maine: margin of the Penobscot River, Winn, July 10, 1916, *Fernald & Long*, no. 14,063; river-thicket by the Penobscot, Orono, July 5, 1890, *M. L. Fernald*, 1891, *Kate Furbish;* low woods by Hermon Pond, Hermon, July 8, 1916, *Fernald & Long*, no. 14,062; alluvial thicket by Marsh Stream, Frankfort, July 21, 1916, *Fernald & Long*, no. 14,065; along the Kennebec, Carrying Place, Somerset County, July 29, 1892, *M. L. Fernald;* alluvial thickets by the Kennebec, Fairfield, July 24, 1916, *Fernald & Long*, no. 14,066; by Sebasticook River, Clinton, June 27, 1911, *R. C. Bean;* alluvial woods by the Kennebec, Vassalboro, July 6, 1916, *M. L. Fernald*, no. 14,061; steep bank by the sea, Rockland, August 22, 1909, *M. L. Fernald;* river-thicket, Sandy River, Farmington, September, 1892, and September, 1902, *C. H. Knowlton;* banks of Androscoggin River, Gilead, 1897, *Kate Furbish;* forming an extensive tangle, inner side of gravelly barrier bar, Gerrish Island,

Kittery, August 11, 1916, *Fernald & Long*, no. 14,068. NEW HAMPSHIRE: Androscoggin River, Shelburne, July 11, 1882, *Walter Deane;* roadside west of Gates Cottage, Shelburne, September 12, 1907, *A. S. Pease*, no. 10,798; climbing high over trees by the Androscoggin, Shelburne, September 27, 1916, *A. S. Pease*, no. 16,908; near Mascomp Lake, Enfield, August 22, 1878, *H. G. Jesup.* MASSACHUSETTS: Georgetown, August 9, 1907, *E. F. Williams;* Sudbury, September 2, 1885, *C. W. Swan;* roadside, North Wilbraham, May 16 & 18, 1913, *M. L. Fernald & F. W. Hunnewell, 2nd;* banks of Connecticut River, Hadley, July 1, 1874, *H. G. Jesup.* CONNECTICUT: banks of Connecticut River, South Windsor, October 8, 1890, *E. Watson.*

Although resembling *V. Labrusca* in its usually continuous tendrils and inflorescences, in the contour of the leaf as well as in the rufescent tomentum of the very young leaves, and in its large fruits and seeds, *V. novae-angliae* in no material examined shows any tendency to retain the tomentum as does *V. Labrusca,* except as an insignificant vestige along the nerves on the lower side of the leaves. Its fruit has a clear, sharp acid flavor and quite lacks any suggestion of the "muskiness" so characteristic of *V. Labrusca.* If the species were a hybrid of *V. vulpina* and *V. Labrusca* it is almost inconceivable that this peculiar flavor so characteristic of *V. Labrusca* should not appear in *V. novae-angliae.*

V. vulpina, which *V. novae-angliae* resembles in its green foliage and in its habitat in rich river-alluvium, has the more elongate leaves jagged-dentate with prolonged teeth; the young growth not rufescent; the tendrils and inflorescences with much more interrupted distribution; and the berries and seeds decidedly smaller.

VI. GENTIANA CLAUSA A VALID SPECIES.

In the *Synoptical Flora of North America* Gray clearly defined the corolla-characters separating *Gentiana Saponaria* L. and *G. Andrewsii* Griseb. In the former species, as stated by Gray, the corolla is "light blue, an inch or more long, its broad and roundish short lobes erect, little and often not at all longer than the 2-cleft and many-toothed intervening appendages"; while in *G. Andrewsii* the corolla is "as the preceding but more oblong and the lobes obliterated or obsolete, the truncate and usually almost closed border mainly consisting of the prominent fimbriate-dentate intervening appendages." [1]

[1] Gray, Syn. Fl. ii. pt. 1, 122 (1878).

That Gray clearly understood the two species is shown not only by his treatment in the *Synoptical Flora* but by the specimens which bear the labels inserted by him at that time. Subsequently, however, it has become a quite general practise to treat essentially all the large-leaved Closed Gentians of New England, northern and central New York and adjacent Canada as *G. Andrewsii*, presumably because of their very definitely "closed" corolla, although a few specimens from the northern states have been called *G. Saponaria*. A study of the northern material shows, however, that the common plant of New England and of many parts of the northern states and adjacent Canada is neither *G. Andrewsii* nor *G. Saponaria*, but is a distinct species combining the foliage-characters of *G. Andrewsii* with the corolla-characters nearly of *G. Saponaria*. This plant, which is apparently rare south of the northern states, extends along the mountains somewhat locally to North Carolina, occurring there only at the higher altitudes (Roan Mountain, etc.). This is the species which was well characterized (as Rafinesque's descriptions go) by Rafinesque as *G. clausa*.[1] Rafinesque's description was as follows:

"5. *G. Clausa* Raf. Closed Gentian. Stem round smooth, leaves ovate lanceolate, acuminate, subtrinerve: flowers verticillate, sessile; calix four to six cleft angular, segments foliaceous short: Corolla clavate, short, closed 8–10 teeth, internal teeth equally bilobe. On the Taconick and Green mountains, flowers blue, half the size of *G. Saponaria* and quite shut. Variety with ternate lanceolate leaves."

As above implied *G. Andrewsii* is a less common plant in New England than *G. clausa;* in fact, its representation in the Gray Herbarium and the herbarium of the New England Botanical Club indicates that it is extremely local, the only New England material found in these herbaria coming from eastern Massachusetts. Whether the plant is as local as this herbarium-representation implies of course can be determined only by further field-study, but it is significant that among the scores of herbarium sheets which have accumulated from the New England region practically all should prove to be *G. clausa* rather than *G. Andrewsii*.

G. Saponaria has been included in many New England lists but so far as the writer can determine this species is essentially a coastal plain plant extending northward along the coastal plain to Staten Island

[1] Raf. Med. Fl. i. 210 (1828).

and Long Island and occurring very locally in central New York. No New England material of it has been observed.

To summarize, the three plants which have been so generally confused in northeastern floras may be distinguished by the following key:

Corolla with nearly truncate summit; the firm true lobes nearly obsolete, narrowed at summit; the broader intervening thin prolongations of the membranous bands forming a fimbriate-dentate border.....*G. Andrewsii.*

Corolla with the broad rounded lobes 2–8 mm. long, as broad as or broader than the intervening 2–3-cleft appendages.

Leaves lanceolate to ovate-lanceolate, acuminate: involucre of 4–6 leaves; the 2–4 outer (except in dwarf specimens) subequal, 5–10 cm. long, 2–4 cm. broad: calyx-lobes herbaceous, oblong to obovate, finally spreading: corolla 2.5–4 cm. long, scarcely opening; the rounded lobes slightly incurved.....*G. clausa.*

Leaves oblong to elliptic, acute or obtuse, not acuminate: involucre of 2–4 leaves, the outer 3–6.5 cm. long, 0.7–2 cm. broad: calyx-lobes firm, linear to oblanceolate, ascending: corolla 3–5 cm. long, distinctly open; the rounded to subacute lobes erect.....*G. Saponaria.*

Further observation of the plants is required before the exact distribution in the northeast is known, but at present it may be stated as follows:

GENTIANA ANDREWSII Griseb.— Meadows, prairies, low thickets, banks of streams, etc., frequent in the southeastern states, extending locally northward and eastward to York, Frontenac and Carleton Counties, Ontario, Ottawa and Hochelaga Counties, Quebec, and eastern Massachusetts.

G. CLAUSA Raf.— Borders of rich woods and thickets, banks of streams, meadows, etc., locally abundant from Kennebec County, Maine, to Lake Champlain, New York, and westward to western New York, southward to Bristol County, Massachusetts, Providence County, Rhode Island, southern Connecticut, and locally along the mountains to North Carolina.

G. SAPONARIA L.— Glades and sandy swamps of the coastal plain and piedmont regions north to Staten Island and Long Island, and very locally inland to Yates County, New York (*Sartwell*).

The writer has not seen fresh flowers of either *G. Andrewsii* or *G. Saponaria* but the fresh flowers of *G. clausa* are of a decided porcelain-blue color quickly changing in age or in drying to a rich blue-violet.

VII. SOME FORMS OF AMERICAN GENTIANS.

GENTIANA AMARELLA L. Sp. Pl. i. 230 (1753). *G. acuta* Michx. Fl. Bor.-Am. i. 177 (1803). *G. plebeja* Cham. ex Bunge, Moscou Soc. Nat. Hist. Nouv. Mém. i. 250, t. 9, fig. 5 (1824). *G. Amarella*, var.

acuta (Michx.) Herder, Act. Hort. Petrop. i. 428 (1872). *Amarella acuta* (Michx.) Raf. Fl. Tellur. iii. 21 (1836). *A. plebeia* (Cham.) Greene, Leaflets, i. 53 (1904). *A. Amarella* (L.) Cockerell, Am. Nat. xl. 871 (1906).— I am unable to discern any constant differences between the American and the European plant. The differences maintained by Grisebach all fail in a good series of specimens. Grisebach's statement, under *G. acuta,* was as follows:

"This species is extremely like our *G. Amarella;* it seems, however, to differ constantly in the way the leaves embrace the stem. In *G. Amarella* the lamina of the two leaves ends at that point where they are affixed to the stem, so that they are separated from each other by an interstice formed by the stem; while in *G. acuta* the bases of both leaves touch each other without any interstice, so that the substance of the leaves itself is somewhat connate: this character seems to be invariable throughout all those numerous forms in which these species are so rich; the upper leaves of *G. acuta* are, besides, always longer and more acute, and the leaves near the root are more or less spathulate, while in *G. Amarella* the leaves are always more equal in the same individual; the beard of *G. acuta* is longer and thinner, so as to disappear almost wholly here and there; the flowers are somewhat smaller; the calyx is shorter and more unequal; the stem more angular, and commonly almost winged. Besides, most of its forms are much stiffer, taller, and more branched; the stem often produces such slender and numerous branchlets from the under axillae as has been mentioned above of *G. propinqua.*" [1]

As stated, every one of these points urged by Grisebach fails, and many American specimens are closely matched in all details by European specimens.

Gray stated that var. *acuta* has the "crown usually of fewer and sometimes very few setae," [2] and Engelmann that it has 5-parted flowers while "The true European *G. Amarella* has usually 4-parted flowers"; [3] but examination of plates of the European plant, if specimens are not available, quickly disposes of the latter point, for the European, like the American, has frequently 5-merous flowers. And the crown of nearly all American material is quite as fully developed as in the European; in fact most specimens have essentially identical crowns.

[1] Grisebach in Hook. Fl. Bor.-Am. ii. 64 (1838).
[2] Gray, Syn. Fl. ii. pt. 1, 118 (1878).
[3] Engelm. in Wheeler Exped. Rep. vi. Bot. 195 (1879).

Attempts have been made to distinguish the American from the Old World plant by the more acute corolla-lobes and smaller seeds, but abundant specimens show these characters to fail and this was realized as early as 1862 by Engelmann when he wrote: "*G. acuta* is evidently but a form, a geographical variety of *G. Amarella*, as Dr. Hooker has indicated, and which is confirmed by our dwarf variety and other forms collected in Colorado. . . .; the characters of acutish lobes of the corolla and small seeds do not hold good; Dr. Parry's No. 307 has seeds as large as *G. Amarella* from Prussia, and several forms have quite obtuse lobes." [1]

Nearly all authors have agreed that *G. acuta* and *G. plebeja* are identical and in view of this fact it is worthy of note that Chamisso himself did not publish *G. plebeja*. It was published by Bunge in 1824 as "*G. plebeja* Chamisso in litteris"; but promptly, in 1826, Chamisso & Schlechtendal repudiated the species, placing it unequivocally under *G. Amarella* and saying: "Huic speciei addinus Gentianam in herbosis insulae Unalaschka lectam olinque sub nomine G. plebejae a Chamissone cum amicis communicatam." [2]

Although *G. acuta* does not differ even varietally from *G. Amarella* it is noteworthy that Michaux's type material collected at Tadousac in eastern Quebec was not the common lilac-flowered form of the plant but a somewhat unusual form with the flowers creamy-white or yellowish, or, as described by Michaux "viridi-lutei." This ochroleucous form is occasional about the Gulf of St. Lawrence, sometimes occupying habitats by itself, sometimes with the more common lilac-flowered *G. Amarella*. It is a striking color-variation but, in view of the fact that the name *G. acuta* has been so generally used in the specific or varietal sense, it would be highly misleading to perpetuate the descriptive name *acuta* for a form which is characterized only by its yellowish flowers and not by any other differences. This ochroleucous form may, therefore, be designated

G. AMARELLA L., forma **Michauxiana**, n. nom. *G. acuta* Michx. Fl. Bor.-Am. i. 177 (1803), in the strict sense.— Corolla ochroleucous.

G. QUINQUEFOLIA L., forma **lutescens**, n. f., lobis corollae ochroleucis.

Corolla-lobes ochroleucous.— Occasional in the range of the typical lilac-flowered form. As TYPE may be designated material in

[1] Engelm. Trans. St. Louis Acad. Sci. ii. 214 (1862).
[2] Cham. & Schl. Linnaea, i. 181 (1826).

the Gray Herbarium, collected in Chester County, Pennsylvania, by *T. C. Porter*, November 2, 1886.

G. CRINITA Froel., forma **albina**, n. f., lobis corollae albis.

Corolla-lobes white.— Occasional with the typical blue-flowered form. TYPE: Waverley, Massachusetts, September, 1894, *T. D. Bergen* (in Gray Herb.).

G. LINEARIS Froel., forma **Blanchardii**, n. f., lobis corollae albis.

Corolla-lobes white.— Occasional in the range of the species. TYPE in Gray Herbarium, collected on open roadside, Woodford, Vermont, August 15, 1902, *W. H. Blanchard*.

White-flowered forms of the other closed Gentians undoubtedly occur but so far as the writer has seen they have been collected only in this species and in *G. Andrewsii* (forma *albiflora* Britton).

VIII. SOME NEW OR CRITICAL PLANTS OF EASTERN NORTH AMERICA.

HIEROCHLOA ODORATA (L.) Wahl., var. FRAGRANS (Willd.) Richter, forma **Eamesii**, n. f., panicula elongata 2–4 dm. longa, ramis paucis remotis.

Panicle elongate, 2–4 dm. long, with few elongate branches.— CONNECTICUT: border of cultivated field beside salt-marsh, Fairfield, May 13, 1910, *E. H. Eames*, no. 8339; field bordering salt-meadows in rich soil, May 27, 1914, *E. H. Eames*, no. 8734 (TYPE in Gray Herb.).

The common plant of boreal North America and the northeastern coast is not true *H. odorata* of the Old World and of the Rocky Mountain region, but is a pronounced variety, so well marked that by Willdenow, Pursh, Roemer & Schultes and other authors early in the 19th century it was considered a distinct species: *Holcus fragrans* Willd. Sp. Pl. iv. 936 (1805), Pursh, Fl. Am. Sept. i. 78 (1814); *Hierochloa fragrans* (Willd.) R. & S. Syst. ii. 514 (1817). Willdenow, however, surmised that it might be a variety, saying: "*Simillimus praecedenti* [*Holcus odoratus*] *differre tamen videtur*, calyce *floribus multo longiore*, corollis *margine non villoso-ciliatis* et flore *hermaphrodito apice laevi. An varietas* ? W." In western North America where true *Hierochloa odorata* abounds the two varieties clearly intergrade as they do in northern Europe.

Dr. Eames's extreme form of var. *fragrans* was distributed as

Savastana Nashii Bicknell, Bull. Torr. Bot. Cl. xxv. 104, t. 328 (1898), subsequently transferred to *Hierochloa* as *H. Nashii* (Bicknell) Kaczmarek, Am. Midl. Nat. iii. 198 (1914);[1] but the Eames material is clearly an extreme development of *H. odorata*, var. *fragrans* rather than the beautifully distinct *H. Nashii*. The latter species has very elongate firm and enduring cauline leaves and flowers in July and August. *H. odorata*, on the other hand, flowers in the eastern states in May and June and by July the short lanceolate soft cauline leaves as well as the culms are quite shriveled and brown.

CYPERUS FILICINUS Vahl, var. **microdontus** (Torr.), n. comb. *C. microdontus* Torr. Ann. Lyc. N. Y. ii. 255 (1836).

C. filicinus Vahl (1806) must displace *C. Nuttallii* Eddy (1820). But the writer is unable to find any absolute character by which to separate *C. microdontus* specifically from it. Typical *C. filicinus* has the scales of the spikelets 2.5–3.5 mm. long, while *C. microdontus* has them only 2 mm. long, but occasionally colonies show scales intermediate in length and clearly bridging the gap between the two. In general, *C. filicinus* prefers saline or brackish habitats but is occasionally found in dune-hollows and other nearly fresh situations. In southeastern Massachusetts, at least, var. *microdontus* seems to be characteristic of fresh sandy pond-shores.

STENOPHYLLUS CAPILLARIS (L.) Britton. *S. capillaris* presents two strikingly different variations which do not seem to have been recognized. In the typical form of the species the spikelets are 5–10 (rarely –20)-flowered, 2.5–7 mm. long, commonly ferruginous, occasionally blackish; all but the central (except in dwarfed plants with reduced inflorescences) commonly on slender pedicels up to 1.5 cm. long; and basal inflorescences are wanting or few and mostly on definite culms. This plant is common in the southern states and extends northward to Schenectady County, New York, northern Vermont, Coös County, New Hampshire, and Kennebec and southern Penobscot Counties, Maine. In the northern half of the range, from Missouri and Virginia northward, there often occurs a plant which in its well developed

[1] Kaczmarek makes the point that, if the American Code throws aside the generic names *Gillenia* Moench, Meth. Suppl. 286 (1802) and *Elodea* Michx. Fl. Bor.-Am. i. 20 (1803) on account of the earlier *Gillena* Adans. Fam. ii. 166 (1763) and *Elodes* Adans. l. c. 444 (1763), followers of that code should also discard the name *Savastana* Schrank, Baier. Fl. i. 100, 337 (1789) because of the earlier *Savastania* Scopoli, Introd. 213 (1777).

extreme appears quite distinct but which clearly passes into typical *S. capillaris*. This is

Stenophyllus capillaris (L.) Britton, var. **cryptostachys**, n. var., spiculis 12–56-floris 4–10 mm. longis plerumque nigrescentibus vel pullis sessilibusque; inflorescentiis basilaribus confertis sessilibus.

Spikelets 12–56-flowered, 4–10 mm. long, commonly blackish or dark-brown and sessile (or only 1 or 2 on short rays): basal inflorescences crowded, closely sessile.— Missouri and Virginia north to Ohio and New England. Type: sandy woods, Monteer, Missouri, October 9, 1910, *B. F. Bush*, no. 6398c (in Gray Herb.).

Carex echinata Murr. Prodr. Fl. Goth. 76 (1770); Britten, Journ. Bot. xlv. 163 (1907); Briq. Prodr. Fl. Corse, i. 199 (1910); not Murr. herb. nor Kükenthal and others. *C. Leersii* Willd. Fl. Berol. Prodr. 28 (1787). *C. stellulata* Good. Trans. Linn. Soc. ii. 144 (1794).— The nomenclature of this species has been most distressingly confused and it is apparent that many botanists have not seen or interpreted in their full significance the above cited notes by Messrs. James Britten and Jean Briquet. Murray, in publishing *C. echinata*, gave absolutely no original description but cited a description of Haller's and a plate in Flora Danica, both of which are unquestionably the plant which was later called *C. Leersii* Willd. or *C. stellulata* Good. Murray's treatment was as follows: "*Carex echinata* mihi f. Car. spicis ternis echinatis glumis lanceolatis, capsulae mucrone simplici Hall. Hist. n. 1366. Oed. Dan T. 284." As distinctly pointed out by James Britten (l. c.), and again by Briquet (l. c.), the fact, that Murray had specimens as *C. echinata* which are not the species described by him under that name, in no way invalidates the use of the name for the plant actually described.

Decodon verticillatus (L.) Ell., var. laevigatus Torr. & Gray, Fl. i. 483 (1840), described as "glabrous; leaves bright green" as contrasted with var. *pubescens* Torr. & Gray, l. c. with "stem and lower surface of the leaves more or less tomentose-pubescent," is a well marked geographic variety. Var. *pubescens* shows a strong inclination to follow the coastal plain and related areas, while var. *laevigatus* is rare or local in the coastal plain region but more general inland. As represented in the Gray Herbarium the two varieties have the following ranges.

Var. pubescens.— Florida to Maine, chiefly on the coastal plain or on the outwash plains of southern New England, extending inland to northwestern Georgia, and in New England to Hampden County,

Massachusetts, and southern Kennebec and southern Penobscot Counties, Maine; also St. Clair County, Illinois to northeastern Illinois, northern Indiana, and southwestern Ontario.

Var. LAEVIGATUS.— Central Illinois and the upland of Tennessee and southwestern Virginia, north to central Wisconsin, western and northern New York, northern Vermont, Grafton County, New Hampshire, and Franklin County, Maine.

ASTER CORDIFOLIUS L., var. **racemiflorus**, n. var., a forma typica recedit foliis cordatis argute dentatis sinu clauso; capitulis valde racemosis, racemis lateralibus divergentibus vel flexuoso-recurvatis.

Differing from the typical form of the species in having the cordate leaves coarsely dentate, and the sinus closed: heads conspicuously racemose; the lateral racemes divergent or flexuous-recurved.— PRINCE EDWARD ISLAND: roadside-thickets and borders of dry woods, Malpeque, August 29, 1912, *Fernald, Long & St. John,* no. 8135 (TYPE in Gray Herb.).

In typical *Aster cordifolius* the cordate leaves are serrate and with an open sinus, and the inflorescence is definitely paniculate, the ascending or spreading branches paniculate-forking.

SENECIO FERNALDII Greenman, Ann. Mo. Bot. Gard. iii. 90 (1916). This little species of the limestone barrens of Table Mountain, Port à Port Bay, Newfoundland, was based by Greenman upon a single specimen. Further material collected by Dr. St. John and the writer in July, 1914 (no. 10,873) shows the species to range from 5–13 cm. in height; the blades of the coriaceous mostly purple-tinged basal leaves to range from narrowly cuneate-obovate to reniform and 0.3–2 cm. long, 0.5–1.5 cm. broad, and to have rounded or acute dentations or even to be lyrate-pinnatifid. The corollas, undescribed by Greenman, have a deep-orange to almost scarlet limb; the tube bears 5 dark stripes up to the sinuses and the lobes are bordered by a similar dark line, and in the expanded flowers the anthers are conspicuously exserted.

Like most of the other species of *Senecio* with discoid heads *S. Fernaldii* has a form with well developed rays, in this case the ligules being broadly oblong, 6 mm. long, 3–3.5 mm. broad, with 3 rounded terminal teeth and 4 dark longitudinal lines. This form may be called

SENECIO FERNALDII Greenman, forma **lingulatus**, n. f., lingulis oblongis 6 mm. longis 3–3.5 mm. latis longitudinaliter 4-lineatis apice 3-dentatis dentibus rotundatis.— NEWFOUNDLAND: very scarce, with the typical discoid form of the species, dry exposed ledges and shingle on the limestone tableland, altitude 200–300 m., Table Mountain, Port à Port Bay, July 16 & 17, 1914, *Fernald & St. John,* no. 10,873a (TYPE in Gray Herb.).

STUDIES IN CERTAIN NORTH AMERICAN SPECIES OF LATHYRUS.

Frederic K. Butters and Harold St. John.

Lathyrus venosus Muhl. is a strictly North American species which is nearly confined to the eastern half of the continent, as all the records by early botanists crediting it to the Rocky Mountains or the Pacific Slope have proved to be founded on misconceptions. As the species ranges from Georgia to Saskatchewan, it is not surprising that it shows considerable variation, and collectors have sometimes noted a certain discrepancy between their different collections, and have commented on it on their labels. Thus we find T. C. Porter saying of a certain specimen, "The large stipules puzzle me!" In spite of such hints, the writers and compilers of floras generally have not recognized or discussed the variability which exists in the size and shape of the stipules, the shape of the leaflets, and the character of the pubescence. The only exception to this is the treatment by Torrey and Gray,[1] who give a general description covering the species and all its variations, and then under this describe two varieties, β and γ. Var. β is said to have "larger oblong-ovate leaflets; stipules linear-lanceolate," and its range is given, "Georgia, *Dr. Boykin.*" We now know this variety from several stations from North Carolina to Texas. It has ovate leaflets, linear-lanceolate stipules, slightly pilose calyx-tubes, and often a little puberulence on the stems and leaflets.

The variety γ of Torrey and Gray is described as being "minutely downy-pubescent; ....stipules linear lanceolate,....calyx and pedicels densely pubescent," and as growing from Saskatchewan to the shore of Lake Superior and Illinois, "also N. W. Coast and California, ex *Hooker*." The record taken from Hooker, crediting this variety to California and the Northwest Coast should plainly be excluded as belonging to some one, or more than one, of the large purple-flowered species of the Pacific slope, which resemble *L. venosus*, but which are amply distinct from that species. After eliminating this western element, we can say that we know the variety with linear-lanceolate

[1] Torrey and Gray, Fl. N. Am. i. 274–5 (1838).

stipules and a dense puberulence on the calyx and pedicels, and in fact throughout the plant, from West Virginia and Tennessee, north to Ontario, and west to Saskatchewan.

Variety α of Torrey and Gray is by inference *L. venosus* of Muhlenberg, but it is not described by Torrey and Gray, nor is any statement of its range given except in the general description and the general range of the species, which are so framed as to include all the varieties. *L. venosus* of Muhlenberg was, however, originally described as a glabrous plant with ovate obtuse leaflets, and large ovate semi-sagittate stipules. A plant corresponding entirely to this description grows from northern New Jersey to Virginia.

It can be seen that these varieties of Torrey and Gray are perfectly distinct entities, with a series of correlated characters, and with definite geographical ranges. There are in the Gray Herbarium, however, half a dozen specimens which grow within the range of some one of these entities, but which have a greater or less admixture of characters. Such a specimen is one collected by *Frank C. Gates*, no. 1682.5, June 22, 1907, in an open grassy thicket, Winnetka, Illinois. Growing within the range of var. γ of Torrey and Gray, it has the heavy uniformly distributed hirtellous pubescence of that variety, the broadly ovate leaflets of their var. β and the broad ovate-lanceolate stipules of *L. venosus* of Muhlenberg sensu stricto. The existence of such specimens as this has convinced the authors that the entities noted above, though for the most part easily recognizable, and possessing definite geographical ranges, should be treated as varieties rather than as species. In the following synopsis we have indicated the characters of the species and of each of the varieties, and have assigned names to the latter.

LATHYRUS VENOSUS Muhl. in Willd. Sp. Pl. iii. pt. 2, 1092 (1803); *Orobus Mühlenbergii* Alefeld, Bonplandia, ix. 146 (1861). Plant nearly glabrous: stems stout, 4-angled, ridged and striate, but not winged, climbing, attaining a length of about 1 m.: stipules ovate-lanceolate, semi-sagittate; those of the lower nodes 2–3.5 cm. long, 4–10 mm. broad; leaflets 10–12, elliptic or ovate-elliptic, mucronate, dark green above, paler beneath, with the veins prominent, 1.5–6.5 cm. long, 1–2.8 cm. wide, opposite or sub-alternate: peduncles one half to two thirds the length of the subtending leaves, 5–10-flowered: flowers 15–20 mm. long; calyx glabrous except for the ciliation on the sepals; the two upper sepals short and convergent, the three lower, linear-lanceolate; corolla purplish.

TYPE COLLECTION: "*in* Pensylvania, *Muhlenberg*."

Specimens examined: NEW JERSEY: rocky banks of the Delaware River, Phillipsburg, Warren Co., June 5, 1910, *K. K. Mackenzie*, no. 4585 A; banks of the Delaware River in Warren and Hunterdon Cos., June and July 1882, *Thos. C. Porter*. PENNSYLVANIA: Bethlehem, June 8, 1873, *Thos. C. Porter;* banks of the Lehigh River, Lehigh Co., 1865, *A. P. Garber*. MARYLAND: on rocks at Great Falls of the Potomac, May 10, 1899, *Th. Holm*. DISTRICT OF COLUMBIA: alluvial ground, vicinity of Washington, May 6, 1896, *E. S. Steele*. VIRGINIA: Glasgow, May 29, 1909, *Edwin B. Bartram*.

Var. **meridionalis**, n. var., var. β of Torrey and Gray, Fl. N. Am. i. 274 (1838), a specie differt caule paulo hirtello; stipulis minoribus lineari-lanceolatis semi-sagittatis ad nodos inferiores 1–1.5 cm. longis 1.5–3 mm. latis, ad nodos superiores minimis; foliolis late ovatis obtusis hirtellis vel glabratis; pedunculis 5–18-floriferis; calyce paulo hirtello vel glabrato.

This variety differs from the species in having the stem lightly hirtellous; the stipules smaller, linear-lanceolate and semi-sagittate, those of the lower nodes 1–1.5 cm. long, 1.5–3 mm. wide, those of the upper nodes very minute; the leaflets broadly ovate, obtuse, hirtellous or glabrate; peduncles 5–18-flowered; the calyx lightly hirtellous or glabrate.

Specimens examined: NORTH CAROLINA: wooded slopes of Pisgah Mountain, June 16, 1897, *Biltmore Herbarium*, no. 1222 b; mountains, Hot Springs, June 3, 1899, *J. R. Churchill*. GEORGIA: *S. Boykin* (TYPE in Gray Herb.); *Nuttall*. LOUISIANA: banks of streams, Shreveport, April 20, 1901, *Wm. M. Canby*. TEXAS: *Wright*. Also specimens grown in the Harvard Botanical Garden, from seed collected near the French Broad River, Tennessee.

Var. **intonsus**, n. var., var. γ of Torrey and Gray, Fl. N. Am., i. 274 (1838); *L. multiflorus* Nutt. ex Torrey and Gray, loc. cit.; *L. decaphyllus* Hooker, Fl. Bor.-Am. i. 159 (1840); probably also *L. decaphyllus* Pursh, Fl. Am. Sept. 471 (1814), a specie differt planta tota hirtella; stipulis minoribus, lineari-lanceolatis semi-sagittatis ad nodos inferiores 1.2–2 cm. longis, 2.5–5 mm. latis, ad nodos superiores angustissimis; foliolis ellipticis; pedunculis 6–18-floriferis.

This variety differs from the species in being hirtellous throughout; in attaining the height of 2 m.; in having smaller stipules, which are linear-lanceolate and semisagittate, those of the lower nodes 1.2–2 cm. long, 2.5–5 mm. wide, those of the upper nodes very narrow; and in the 6–18-flowered peduncles. It differs from the var. *meridionalis* in its greater pubescence, its somewhat larger stipules, and especially in the form of the leaflets, which are elliptic instead of broadly ovate.

Specimens examined: WEST VIRGINIA: altitude 2500–3400 ft., Kates Mountain, Greenbrier Co., May 17, 1893, *A. A. Heller*. TENNESSEE: shady bank, Lookout Mountain near Chattanooga, May 18, 1911, *J. R. Churchill*. ONTARIO: hillside near Galt, June 6, 1905, *Geo. Prescott;* Point Edward, Lake Huron, June 19, 1901, *John*

Macoun, Can. Geol. Surv. no. 34,218; twenty miles up the Kaministiqua, Lake Superior, July 12, 1869, *John Macoun* no. 20. WISCONSIN: Green Bay, June 9, 1898, *J. H. Schuette;* Despere Ledge, June 30, 1882, *J. H. Schuette* (TYPE in Hb. Gray). MINNESOTA: Nicollet, June, 1892, *C. A. Ballard;* Lake City, June 25, 1883, *W. H. Manning.* MANITOBA: Lake Winnepeg Valley, 1857, *Bourgeau.* NORTH DAKOTA: thickets in Turtle Mountains, July 24, 1902, *J. Lunell.* SASKATCHEWAN: 1858, *E. Bourgeau;* Cypress Hills, June 27, 1894, *John Macoun.*

In the study of the varieties of *Lathyrus venosus* described above, it has become evident that there has been much confusion in the nomenclature of certain western species of this genus. This confusion has arisen chiefly from varying interpretations of *L. decaphyllus* and *Vicia stipulacea* of Pursh, and *L. polymorphus* of Nuttall.

Lathyrus decaphyllus Pursh, Fl. Am. Sept. ii. 471 (1814), is described as follows: "L. caule tetragono, stipulis semisagittatis linearibus, foliis 5-jugis: foliolis oblongo-ellipticis mucronatis, pedunculis 3–4 floris. On the banks of the Missouri. 2l. v. s. Flowers purple, large; pods large." The plants which Pursh described in the body of his flora as from "the banks of the Missouri" were mainly those collected by Lewis and Clark on their exploring expedition, but this species is not mentioned in any of the recent editions of their Journals nor is it among the Lewis and Clark plants now deposited in the herbarium of the Academy of Natural Sciences of Philadelphia. A manuscript note of Dr. Gray's shows that the type specimen was not among the Pursh plants in the Lambert Herbarium, when he examined them. It is therefore exceedingly improbable that the type of this species is now in existence, and consequently the interpretation of it must rest entirely upon the description in Pursh's Flora. In 1818 Nuttall [1] interpreted *L. decaphyllus* Pursh as identical with *Vicia stipulacea* Pursh. There seems to be little justification for this, as the latter species has narrowly linear-lanceolate leaflets, instead of the oblong-elliptic ones attributed to *L. decaphyllus*. Following Prof. N. L. Britton,[2] recent American authors have applied the name *L. decaphyllus* to a low, large-flowered species of the Rocky Mountains of Colorado, New Mexico and Arizona. This species is said to occur as far north as southern Idaho, but even granting the correctness of this report, it still fails by three hundred miles to reach the

[1] Nuttall, T., Genera of N. Am. Pl. ii. 97 (1818).
[2] Mem. Torr. Bot. Club, v. 207 (1894).

"banks of the Missouri," which is the type location of Pursh's species. Besides the discrepancy of range, this Rocky Mountain species differs from *L. decaphyllus* as characterized by Pursh, in having elliptic-lanceolate instead of oblong-elliptic leaflets, and in very rarely possessing five pairs of leaflets. Although Pursh described his species as having only 3–4 flowers, the authors feel, on account of the other characters,— the semi-sagittate linear stipules and the five pairs of oblong-elliptic mucronate leaflets,— and on account of the type locality, that *L. decaphyllus* Pursh was in all probability identical with the plant above described as *L. venosus* var. *intonsus*. It may be noted that Hooker [1] made a similar interpretation of Pursh's species, although he failed to recognize its specific identity with the eastern form of *L. venosus*.

The only other name which has been used for the Rocky Mountain species which we have deprived of the name *L. decaphyllus*, is *L. polymorphus* Nutt.[2] In the original publication of this name, after the technical description, Nuttall adds, "HAB. On the grassy alluvial plains of the Missouri, from its confluence to its sources? Flowers as large as those of *Pisum maritimum*, and of a fine purple, variable however in size as well as the leaves, hence it appears to be *L. decaphyllus* PH 2. p. 471, and *Vicia stipulacea* of the same, 2. p. 739. as both these specific names are inexpressive and deceptive, I could not in candour do otherwise than reject them." Now, we have already shown that *Lathyrus decaphyllus* Pursh, and *Vicia stipulacea* Pursh are not identical. Excluding, then, Nuttall's synonym, *L. decaphyllus*, his description of *L. polymorphus*, in greater part at least, is applicable to *Vicia stipulacea* of Pursh, and we would, accordingly relegate it to the synonymy of the latter species, since we cannot reject an older specific name as "inexpressive and deceptive." As will appear below, Pursh's *Vicia stipulacea* is not the Rocky Mountain species now under discussion. It is possible that even more than two species entered into Nuttall's conception of *L. polymorphus*, but if so, we are unable to identify them, and the range given seems to preclude entirely the application of this name to the Rocky Mountain species discussed above. We are, therefore constrained to describe this well known plant as a new species.

LATHYRUS **eucosmus**, n. sp. — *L. polymorphus* of Torrey and Gray in part, and of later American authors, not of Nuttall; *L. decaphyllus*

[1] Hooker, W. J., Fl. Bor.-Am. i. 159–60 (1839).
[2] Nuttall, T., Genera of N. Am. Pl. ii. 96–7 (1818).

of Britton, Mem. Torr. Bot. Club. v. 207 (1894), not of Pursh or Hooker — humilis, ramosus saepe decumbens pilosus vel saepius basim versus glabratus, 1.5–3.5 dm. altus; caule 1–3 mm. crasso striato 4-angulato haud alato; stipulis lineari-lanceolatis attenuatis semisagittatis 5–22 mm. longis, 1–4 mm. latis, nervosis; foliolis 4–12 subalternis elliptico-lanceolatis mucronatis 1.5–6 cm. longis, 3–13 mm. latis, nervosis; cirrhis simplicibus vel 2–3-fidis; ramis cum pedunculis 1–3 folia superantibus 2–5-floriferis instructis; floribus magnis pulchris purpureis 1.8–3 cm. longis; calyce campanulato oblique 5-dentato, dentibus superioribus brevibus adscendentibus, inferioribus attenuatis patentibus.

Plant low and branching, often decumbent, pilose, or more frequently glabrate towards the base, 1.5–3.5 dm. tall: stem striate and 4-angled, not at all winged, 1–3 mm. in thickness: stipules linear-lanceolate, attenuate semisagittate, 5–22 mm. in length, 1–4 mm. in breadth, with prominent raised nerves; leaflets 4–12 in number, sub-alternate, elliptic-lanceolate and mucronate, the longitudinal nerves raised and prominent, leaflets 1.5–6 cm. long, 3–13 mm. wide; tendrils unbranched, or 2–3-parted: branches of the stem bearing 1–3 peduncles, which are 2–5-flowered, and exceed the leaves: flowers beautiful, large and purple, 1.8–3 cm. long; calyx campanulate obliquely 5-toothed, the upper teeth short and ascending, the lower elongate and divergent.

Specimens examined: COLORADO: Rocky Mountains, 1862, *E. Hall & J. P. Harbour*, no. 111; low lands by streams on the plains, Golden City etc., May 25, 1870, *E. L. Greene*, no. 94; Gunnison, altitude 7680 ft., July 7, 1901, *C. F. Baker*, no. 355; Sapinero, altitude 7250 ft., June 19, 1901, *C. F. Baker*, no. 181; clay hillside, altitude 5400 ft. Naturita, May 16, 1914, *Edwin Payson*, no. 312; Gato, June 18, 1899, *C. F. Baker*, no. 432; roadsides below Mancos, July 8, 1898, *C. F. Baker, F. S. Earle* and *S. M. Tracy*, no. 413; collected on Long's 1st expedition, *Dr. James*. NEW MEXICO: altitude 7044 ft., Santa Fe, June, 1874, *J. T. Rothrock*, no. 3; altitude 7200 ft., Santa Fe, May 4, 1897, *A. A. & E. Gertrude Heller*, no. 3658 (TYPE in Gray Herb.); 1847, *A. Fendler*, no. 115; Gray, altitude 6000 ft., June 13, 1898, *Josephine Skehan*, no. 24; Fort Wingate, 1882, *W. Matthews*, no. 18. ARIZONA: Little Colorado, *Dr. Newberry;* 1880, *Mr. & Mrs. J. G. Lemmon*.

Of the various names mentioned above, which have been tossed about from one species to another, there is but one left to dispose of, *Vicia stipulacea* of Pursh.[1] This species was described in considerable detail by Pursh, in the supplement to his Flora. The type was collected by Bradbury, presumably along the Missouri River, somewhere

[1] Pursh, F., Fl. Am. Sept. ii. 739 (1814). The original spelling is *Vicia stipulacca*, an obvious misprint, which has been uniformly quoted as *V. stipulacea*. Unfortunately the name occurs but once, in Pursh's Flora, as the supplement is not indexed. The so-called second edition of the Flora is merely an identical reprint.

between its mouth and the site now occupied by Bismark, North Dakota. The actual type specimen is now in the herbarium of the Academy of Natural Sciences of Philadelphia. There is also a small fragment of the same specimen, given to Dr. Gray many years ago, and now in the Gray Herbarium. Mr. Bayard Long has been kind enough to examine the Philadelphia specimen for us. He writes, "There are two quite similar plants, mounted on one of the old smaller-sized sheets characteristic of 'Pursh's specimen!' (as they are marked) with an original ticket '*Vicia Stipulacea*' and also pencilled on (as a copy of data on the back of the sheet) Louisiana, Bradbury'." Mr. Long gives a detailed description of the specimens, which corresponds exactly with the fragment in the Gray Herbarium, and with our conception of the species formed from Pursh's description. It is the abundant plant of the dry plains of Nebraska, Kansas, Oklahoma, Wyoming and Colorado, which has commonly passed under the name of *L. ornatus* Nutt. This plant has simple or bushily branched striate 4-angled wingless stems: stipules linear or linear-lanceolate with prominent nerves, often half the size of the leaflets, and sometimes slightly semi-sagittate, the lower lobe much shorter than the upper; the leaflets 4–10, opposite or sub-alternate, narrowly linear or linear-lanceolate, mucronate; the tendrils reduced to a mere bristle or wanting: the peduncles 2–7-flowered, exceeding the leaves; the flowers purple, large and showy, 2–3 cm. long. It is either quite glabrous, as is the type material, or densely sericeous throughout, the phase described as *L. ornatus* Nutt., var. *incanus* Smith & Rydb., and later raised by Dr. Rydberg to specific rank without any further discussion of its characters.

Lathyrus polymorphus Nutt.,[1] excluding the synonym *L. decaphyllus* Pursh, is, as stated above, and as maintained by Nuttall, himself, a synonym of *Vicia stipulacea* Pursh, but as the latter name was published at an earlier date, and is not invalidated in any way, it cannot be rejected.[2]

[1] Nuttall, T., Genera of N. Am. Pl. ii. 96–7 (1818).

[2] *Lathyrus stipulaceus* Le Conte in Torrey's Catalogue of the Plants of New York, 92 (1819), taken up by De Candolle (Prod. ii. 371, 1825) and Hooker (Fl. Bor. Am. i. 160, 1840), was later reduced by Torrey himself (Fl. of the State of N. Y. i. 158, 1843) to the position of a pure synonym of *L. myrtifolius* Muhl., and has been so regarded ever since. According to the International Rules, the existence of this invalid homonym cannot invalidate the use of the specific name *stipulaceus*, for the plant now under discussion. Apparently Hooker applied Le Conte's name to some plant other than the New York plant to which it was originally given, possibly to some form of *L. venosus*, but his interpretation of this name is of neither taxonomic nor nomenclatorial interest, as the name itself has obviously no validity.

Torrey and Gray, in their Flora [1] published one of Nuttall's manuscript names, *Lathyrus ornatus*. Specimens of Nuttall's original collection are in the Gray Herbarium, and in the herbarium of the Academy of Natural Sciences of Philadelphia. They are marked in Nuttall's handwriting, "Lathyrus * ornatus, Kansa prairies." This appears in Torrey and Gray's Flora as "Kamassa prairies," but in the copy now in the library of the Gray Herbarium there is a marginal note made by Dr. Gray, changing Kamassa to Kansa. Mr. Bayard Long, after comparing the type specimens of *Vicia stipulacea* Pursh and *Lathyrus ornatus* Nutt. in the herbarium of the Philadelphia Academy, reports to us, "I should say that they are unquestionably identical!"

Without further discussion, we proceed to make the new combinations which are necessary:

LATHYRUS **stipulaceus** (Pursh), n. comb. *Vicia stipulacea* Pursh, Fl. Am. Sept. 739 (1814); *Lathyrus polymorphus* Nutt. in greater part, Gen. N. Am. Pl. ii. 96–7 (1818); *L. ornatus* Nutt. ex T. & G., Fl. N. Am. i. 277 (1838).

L. STIPULACEUS (Pursh) Butters & St. John, var. **incanus** (Smith & Rydb.), n. comb. *L. ornatus* Nutt., var. *incanus* Smith & Rydb. Bot. Sem. Univ. Nebr. pt. 21, 64 (1895); *L. incanus* (Smith & Rydb.) Rydb. Bull. Torr. Bot. Club, xxxiii. 144 (1906).

CAMBRIDGE, MASSACHUSETTS.

A PRAIRIE NEAR ANN ARBOR, MICHIGAN.

HENRY ALLAN GLEASON.

THE original land survey of Washtenaw County, Michigan, now on file in the office of the Register of Deeds, describes a tract of land about six miles north of Ann Arbor as "plains." Several other small areas are described as "prairies," and it is a matter of some botanical interest to ascertain what the original vegetation of such areas was. In every case investigated so far, the so-called prairies have been found to be bogs. Probably the word prairies was suggested to the surveyor by the considerable expanse of level bog covered thickly with *Carex filiformis*.

[1] Torrey and Gray, Fl. N. Am. i. 277 (1838).

The plains, on the other hand, occupy an area of rolling topography, so that their name was probably suggested by the vegetation. The older inhabitants of the region verify this idea, and state that it was originally completely treeless. At the present time it is almost completely under cultivation, and several small groves of native trees occur. The prairie vegetation with which it was formerly covered has disappeared almost completely. A few species still occur along the roadsides, such as *Andropogon furcatus*, *Desmodium illinoense*, *Silphium terebinthinaceum*, *Coreopsis tripteris*, and *Heliopsis scabra*. Further search at other seasons would doubtless reveal others.

Just north of this area there is still preserved a small tract of grassy marsh, about two acres in extent and in almost original condition. This marsh resembles a hydrophytic prairie closely in general appearance, and includes a number of prairie species in its floristic composition.

The wetter portion of the tract is dominated chiefly by *Sorghastrum nutans* and *Sporobolus heterolepis*. The former is a common member of prairie associations farther west, although its distribution ranges eastward to the Atlantic coast. *Sporobolus heterolepis* is listed in manuals as extending east to Connecticut. It is abundant in the prairies of Iowa and adjacent states, is rare in Illinois, and is not listed at all in Beal's Flora of Michigan. With these two grasses is a mixture of other herbaceous species. Some of these are common in Michigan bogs and swamps, as *Sarracenia purpurea*, *Amphicarpa monoica*, *Parnassia caroliniana*, and *Phragmites communis*. Others are equally typical of hydrophytic prairies in Illinois, as *Gentiana procera*, *Liatris spicata*, *Oxypolis rigidior*, and *Solidago ohioensis*, while *Tofieldia glutinosa* suggests the shores of the Great Lakes.

In the drier portion of the area *Sporobolus heterolepis* and *Andropogon furcatus* are dominant. The latter, the well-known blue-joint grass, is typical of the mesophytic prairies of the Middle West. Other prairie species in this portion are *Thaspium aureum*, *Muhlenbergia mexicana*, *Solidago ohioensis*, *Helianthus grosseserratus*, *Phlox pilosa*, *Aster novae-angliae*, *Silphium terebinthinaceum*, *Andropogon scoparius*, *Cypripedium candidum*, *Sorghastrum nutans*, *Liatris spicata*, and *Desmodium illinoense*. Four species common in most Michigan bogs also occur: *Potentilla fruticosa*, *Eupatorium purpureum* var. *maculatum*, *Aspidium thelypteris*, and *Lilium philadelphicum*.

The peculiarity of the small tract, accordingly, lies not so much in

the species represented as in their general grouping and the appearance of the area. The almost complete absence of shrubs, the dominance of grasses, and the level topography combine to give it a strong resemblance to a hydrophytic prairie of northern Illinois. Indeed it may be assumed that this area represents a relic colony of prairie plants, persisting from a time when prairies occupied a wide extent in southern Michigan, and now somewhat mixed with various marsh species which have immigrated in recent times from the neighboring swamps and bogs.

Paper no. 157 from the Botanical Laboratory
of the University of Michigan.

REMARKS ON SEVERAL NORTH AMERICAN SPECIES OF ALOPECURUS.

Harold St. John.

A thorough study of abundant material and dissections of spikelets from each specimen have made it clear to the writer that *Alopecurus geniculatus* L. and *A. aristulatus* Michx.[1] have constant characters and should be treated as distinct species.

A. aristulatus Michx. is a native of northern Europe, Asia, and in America from the region of the Gulf of St. Lawrence south to Maryland and west to the Pacific slope. It has a short straight awn attached to the back of the lemma midway between its top and base. The awn is included in or slightly extruded beyond the glumes. Mature spikelets measure from 2–2.2 mm. in length.

A. geniculatus L., a native of northern Eurasia, has a long exserted twisted awn attached near the base of the lemma, usually one quarter of the distance from its base to its summit. Mature spikelets of this species measure 3 mm. in length. The drawings in Britton & Brown's

[1] *A. fulvus* Sm. Eng. Bot. xxi. 1, 467 (1805) is synonymous with *A. aristulatus*, and is often taken up for it on the basis of having been published in 1790, as the first volume of Smith's English Botany was, but volume xxi in which the original description and plate appeared was published in 1805. *A. aristulatus* was published by Michaux in his Fl. Bor.-Am. i. 43 (1803).

Illustrated Flora [1] illustrate clearly the spikelet-differences between *A. aristulatus* and *A. geniculatus*. Although rather common in eastern North America, *A. geniculatus* does not seem to occur far away from the habitations or works of man, and it does not seem to be a native.

A series of specimens from the Coastal Plain, from eastern Massachusetts southward to Florida and Texas, and northward in the Mississippi valley to Madison, Wisconsin, have the habit and even the exact awn-characters of *A. geniculatus*, but instead of having spikelets 3 mm. in length, as does that species, these coastal plain specimens have the mature spikelets 2–2.4 mm. in length. The measurements in all these cases apply to the length of the glumes, and do not include the awn. With the exception of the range these plants seem to have no other difference but the size of the spikelet to separate them from the European *A. geniculatus*. Consequently, it is deemed best to treat this plant as an American variety. The labels of the twenty-six sheets of this plant at hand are tantalizingly inadequate in regard to the statement of habitat. The inference is, however, that this plant is a native of North America. Certainly there are no old world species or varieties into which it fits.

Walter described an *A. carolinianus*,[2] which may have been the plant in question, the *A. geniculatus* of current manuals of the botany of the southern states. Walter's description is unfortunately too brief to be capable of exact interpretation. Prof. A. S. Hitchcock in his article on "The Identification of Walter's Grasses" [3] reports that no specimen of this exists in Walter's herbarium, although Pursh seems to have seen it there before publishing his Flora Americae Septentrionalis in 1814. Dr. Gray examined and made notes concerning Walter's plants in February, 1839, but he did not consider the grasses. After a discussion of the conflicting evidence about *A. carolinianus*, Hitchcock concludes, "This species must remain doubtful."

In 1808 Poiret described [4] as a new species *A. ramosus*, giving its characters in great detail. These were drawn from a specimen collected by Bosc in Carolina. This is surely the coastal plain *Alopecurus* under discussion. Further confirmation of this is given by Steudel [5] who maintains Poiret's species *A. ramosus*, cites the *Bosc* specimen

[1] Ill. Fl. ed. 2, i. 192 (1913).
[2] Walter, Thomas: Flora Caroliniana, 74 (1788).
[3] Ann. Rep. Missouri Bot. Gard. xvi. 40 (1905).
[4] Poir. in Lamarck: Encyclopedie Methodique Botanique, viii. 776 (1808).
[5] Steudel, E. G.: Synopsis Pl. Graminearum, i. 147–8 (1854).

from Carolina, and adds one other, "N. Orleans. *Drummond.*" Fortunately there is in the Gray Herbarium a specimen of this latter, and it is without any question the southern plant with small spikelets. All doubt as to the application of the name *A. ramosus* being removed, the new combination is made below.

ALOPECURUS GENICULATUS L., var. **ramosus** (Poir.), n. comb. *A. ramosus* Poir. in Lamarck, Encyc. Meth. Bot. viii. 776 (1808).

TYPE SPECIMEN: CAROLINA: *Bosc.*

SPECIMENS EXAMINED (all in the Gray Herbarium or the Herbarium of the New England Botanical Club). MASSACHUSETTS: path by ditch, Great Meadows, 20 rods east of rocky island, Concord, July 7, 1859, *H. D. Thoreau.* CONNECTICUT: Rocky Hill, June 15, 1894, *Frances Wilson Starmer;* wet places, common, Rocky Hill, May 28, 1894, *Frances Wilson Starmer,* Grasses of Conn., no. 59. PENNSYLVANIA: meadows near Philadelphia, July, 1876, *Isaac C. Martindale.* VIRGINIA: in roadside ditch, Buckroe, May 18, 1912, *B. L. Robinson,* no. 417. SOUTH CAROLINA: damp clay soils, Santee Canal, April, *H. W. Ravenel.* GEORGIA: Chattahoochie, May 2, 1899, *Wm. M. Canby.* FLORIDA: *Chapman;* 1843, *F. Rugel,* no. 223. MISSISSIPPI: Starkville, April 19, 1892, *S. M. Tracy,* no. 1396. LOUISIANA: New Orleans, *Drummond, Riddell;* common in wet ground, Gretna, April 19, 1899, *C. R. Ball,* no. 303. TEXAS: *Wright;* Terrell, May 5, 1904, *F. J. Tyler.* TENNESSEE: damp ground, Jackson, April, 1893, *Samuel M. Bain,* no. 212. OKLAHOMA: Huntsville, April 20, 1896, *Laura A. Blankinship;* at grassy edge of springy creek, Alva, May 1 and 20, 1914, *G. W. Stevens,* nos. 3,018 & 3,044; edge of small pond, Whitehorse, April 30, 1913, *G. W. Stevens,* no. 243; at edge of pond, Cherokee, May 24, 1913, *G. W. Stevens,* no. 643. KANSAS: low ground, Riley Co., May 21, 1895, *J. B. Norton,* no. 600. IOWA: Mt. Pleasant, July 18, 1894, *J. H. Mills.* ILLINOIS: wet lands, Athens, 1861, *E. Hall;* damp heavy ground, Peoria, July, 1903, *F. E. McDonald;* moist soil, Wady Petra, June 13, 1899, *Virginius H. Chase,* Amer. Gr. Nat. Herb. no. 335. WISCONSIN: Madison, *T. J. Hale.*

GRAY HERBARIUM.

VERNONIA ALTISSIMA Nutt. var. **taeniotricha,** var. nov.— Caulis et panicula plus minusve sordide pilosa pilis laxe curvatis multiloculatis; folia supra sparse et sordide pubescentia infra ad costam patenti-pilosa ad venas laterales patenti-pilosula pilis laxis sordidis multiloculatis.— INDIANA: in a prairie habitat, along the Lake Erie Railway, west of Goldsmith, Tipton Co., 26 Aug. 1913, *Mrs. Chas. C. Deam* 14,114; low border of swamp about 6 km. east of Columbia City, Whitley Co., 23 Aug. 1914, *Chas. C. Deam* 14,539 (TYPE in Gray Herb.). ILLINOIS: roadside, Urbana, 23 Sept. 1909, *A. S.*

Pease 12,442. Mississippi: Star, 18 Aug. 1903, *S. M. Tracy* 8537; Agricultural College, Oktibbeha Co., 11–17 Aug. 1896, *C. L. Pollard* 1267.— The following sheets (of which the two latter were labelled *V. altissima* by Mr. Gleason) are similar but have considerably larger heads, and probably represent a different form. Missouri: St. Louis, 1846, *G. Engelmann;* shady banks of Mississippi River, St. Louis, Sept., 1842, *G. Engelmann;* bottoms, Courtney, 2 Oct. 1903, *B. F. Bush* 1906.

From the description of *Vernonia gigantea pubescens* Morris,[1] Proc. Biol. Soc. Wash. xiii. 179 (1900), I was inclined to believe that it might be identical with the variety here described. Examination of the type (U. S. Nat. Herb. 393,253: meadow along Horse & Hound Crs., below Baileysville, Wyoming Co., West Virginia, alt. 335–365 m., 20 Aug. 1900, *Morris* 1274), made possible through the kindness of Mr. P. C. Standley, has shown, however, that such is not the case. The stem of this specimen is smooth nearly to the inflorescence, the leaves subglabrous or subglabrate above, and beneath rather sparsely pubescent with appressed not obviously many-celled hairs. It is more or less discolored with bad drying and somewhat covered with a grayish mold, and the name given it by Morris may have been derived in part from this circumstance. Its pubescence is in fact precisely the same as that of the plant here taken, following Nuttall's description and Gleason's monograph, as typical *V. altissima* Nutt. Morris's plant, however, can scarcely belong to this species, for its phyllaries are rather shortly but distinctly caudate-attenuate. If not referable to *V. glauca* (L.) Willd., from which it scarcely differs save in the slightly smaller heads and somewhat purplish-tinged pappus, it is probably a hybrid of that with some other species.— S. F. Blake, Gray Herbarium.

[1] *Vernonia maxima pubescens* Morris ex Britton, Man. ed. 1.919 (1901); *V. altissima* Nutt. var. *pubescens* (Morris) Daniels, Univ. Mo. Studies, Sci. Ser. i. 402 (repr. 260) (1907).

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

New Series.— No. LI.

TAXONOMIC AND GEOGRAPHIC STUDIES IN NORTH AMERICAN FERNS.

Frederic K. Butters.

(Plate 123.)

Introduction.

Writing about the ferns of China, Christ says, "It has been believed and is still believed, that the distribution of ferns differs essentially from that of Phanerogams, in that the former have more extended ranges, and that endemism among them is less marked. Nothing is more incorrect. In specialization of species and endemism, the class of Pteridophytes is on a level with the remainder of the flora. Wherever the flora has an original character, and endemic forms play a great part, wherever types vary, and give rise to a circle of derived forms, these peculiarities appear strongly also among the ferns." [1]

[1] On a cru, et on croit encore, que la dispersion des Fougères diffère essentiellement de celle des Phanérogams dans ce sens que les premières auraient des aires plus vaste, et que l'endémisme serait moins accentué. Rien n'est plus inexact. La spécialisation des espèces et endémisme dans la classe des Ptéridophytes, vont de pair avec le reste de la flore. Partout où la flore a un caractère original et où les formes endémiques jouent un grand rôle, partout où les types varient et s'entourent d'un cercle de formes dérivées, ces particuliarités s'étendent tout aussi bien sur les Fougères. Christ, H., Les Collections de Fougères de la Chine au Muséum d'histoire naturelle de Paris. Bull. Soc. Bot. de France, lii. Mém. i. 9 (1905).

Nevertheless, the commonly accepted range of some of our most familiar ferns is much more extended than is usual in the case of Phanerogams, and not infrequently is quite at variance with the laws of distribution which have been worked out for the latter type of plants.

In a recent examination of the ferns of the Selkirk Mountains it occurred to the author to make a critical study of some of the forms which are supposed to have a very wide and somewhat anomalous range. It appeared that, in the treatment of closely related species of ferns, and of races within the species, too much reliance had been placed on such superficial characters as details in the form and cutting of the fronds, characters of a kind which botanists have found to be peculiarly unreliable in most groups of plants. It seemed that a study of such technical characters as the size, form and sculpture of the spores, and details of the structure of the sporangia, sori, indusia and scales, might reveal characters of a more stable nature than the purely vegetative ones usually employed. As will be seen in the following series of papers, this study has led, in the case of several of our common groups of ferns, to the separation of species and varieties, in other cases to the recombination of forms supposed to be distinct, and the races characterized by the same technical characters have been found in all cases to have geographical ranges quite in harmony with well-known laws of the distribution of flowering plants.

I. THE GENUS ATHYRIUM AND THE NORTH AMERICAN FERNS ALLIED TO ATHYRIUM FILIX-FEMINA.

1. The Genus Athyrium.

Fern genera are traditionally unsatisfactory, and in no part of the group are they more so than in the alliance of which the lady fern is a member. These form a naturally compact group in which it is sometimes difficult to distinguish clearly between the species, yet in some treatments of the ferns the species described below have been relegated to as many as three different genera, while *Athyrium Filix-femina* itself has been placed by reputable authors in at least four of the larger fern genera. This is largely due to the attempt, current throughout the latter part of the eighteenth, and much of the nineteenth century,

to rely entirely upon the structure of the sorus and indusium for generic distinctions and delimitations. This attempt is now seen to have resulted in an artificial system entirely comparable to the Linnaean system of classification of flowering plants. In some cases, particularly in highly specialized groups, it resulted in bringing together related forms, but it often led to obvious absurdities both of aggregation and of separation. It naturally resulted in particularly illogical results in such a group as *Athyrium*, where the sorus is a peculiarly variable and unstable organ.

The genus *Athyrium* Roth ex Mertens [1] was originally founded entirely upon soral characters which further investigation has shown to be illusory. In view of this it is not strange that botanists like Mettenius and Hooker should have found it impossible to maintain the genus, and should have considered it merely as a section of *Asplenium*. In 1866 and 1870, Milde, however, in two notable papers [2] showed that the lady fern and its relatives differ in several respects from the true *Asplenia*, and refounded the genus *Athyrium* on a firmer basis. He laid particular stress on the structure of the scales in the two genera and on differences in the vascular structure of the frond. He also pointed out that *Phyllitis* (*Scolopendrium*) and *Camptosorus* agree with *Asplenium* in both of these respects, while *Diplazium*, several of the other genera of *Asplenieae*, and the more primitive genera of the *Aspidieae* agree with *Athyrium*. In his second paper he confirms his earlier results so far as the differences between *Athyrium* and *Asplenium* are concerned, but he confesses that he is unable to maintain any generic difference between *Athyrium* and *Diplazium*, and he accordingly transfers a long list of species from the latter genus to *Athyrium*.

In general, the distinctions pointed out by Milde hold very well,

[1] Auszug eines Briefes von Hrn. Prof. Mertens in Bremen an den Herausgeber, Römer's Archiv für die Botanik, ii. pt. 1, 105 (1799).

Roth, A. G., Tentamen Florae Germanicae, iii. 58 (1800).

Roth's diagnostic character was the recurved sorus. Though his description of the genus was evidently based almost wholly on *A. Filix-femina*, which has since been considered the type of the genus, and on its various European forms, which he treated as distinct species, he listed as the first species *A. fontanum*, a genuine *Asplenium* with no close affinity to the lady fern. This species often has some of its sori recurved, and rarely has a few of them hooked as in true *Athyrium*. Roth's reason for placing this fern first was evidently merely that he was arranging all of the species in order, with the least compound first. That he did not consider it typical is evident, as it differs in several respects, notably in its entire indusia, from his generic description.

[2] Milde, J., Das Genus *Athyrium*. Bot. Zeit. xxiv. 373 (1866).

Id., Ueber *Athyrium*, *Asplenium* und Verwandte, Bot. Zeit. xxviii. 329 et sqq. (1870).

though there are a very few species of *Diplazium* in which one or the other breaks down. Such partially intermediate species occur, however, throughout the ferns, and any attempt to unite the larger fern genera on such grounds would result in reducing such a family as the *Polypodiaceae* to a very few genera — possibly to a single genus.

The scales of *Asplenium* consist of oblong cells, apparently nearly square in cross section, and the vertical interior cell-walls are dark colored and much thickened, while the superficial and marginal walls are very thin and transparent. This gives the scale, under the microscope, a clathrate appearance. In *Athyrium*, on the other hand, the typical scales are composed of elongated, more or less fibrous cells which are somewhat rounded in cross section, and all parts of the cell-wall are equally thickened, sometimes slightly, sometimes very greatly.

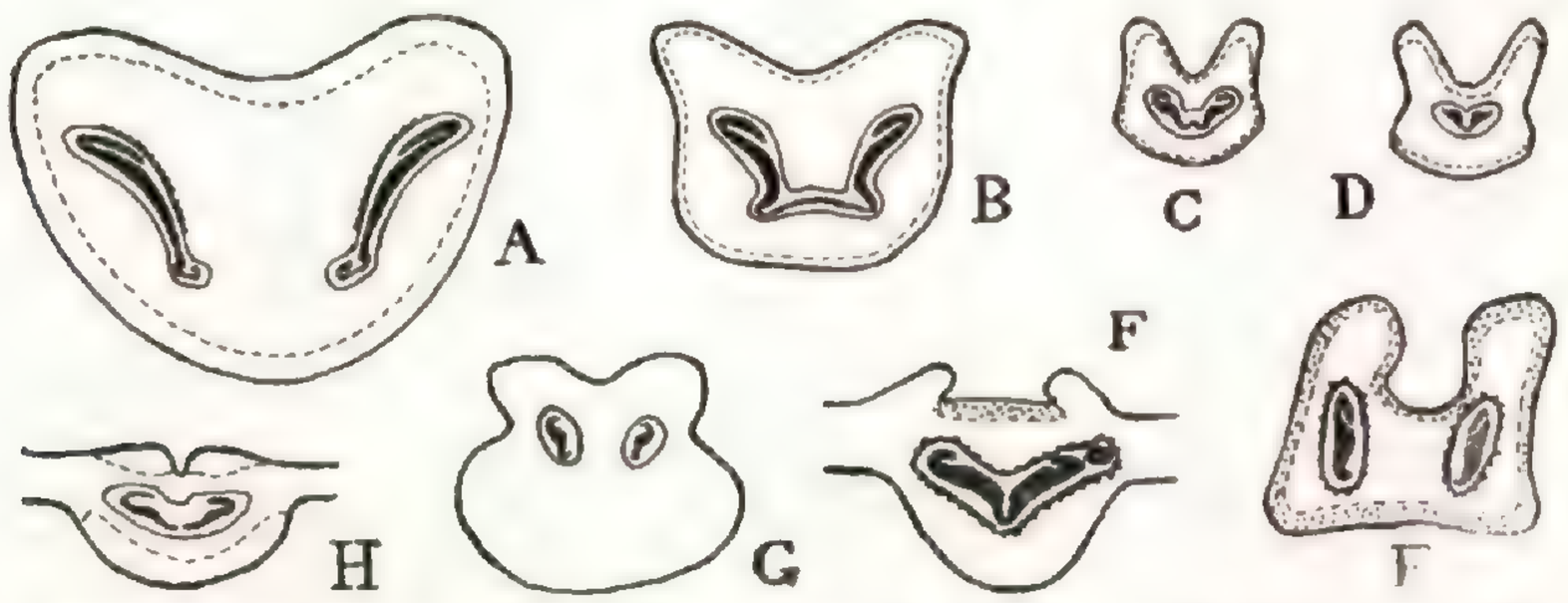

Fig. 1. Structure of the stipe in the genera *Athyrium* and *Diplazium*. A–D, *Athyrium angustum* (Willd.) Presl. A, lower part of the stipe, × 5; B, upper end of the stipe, × 5; C, rachis of the frond; D, midrib of a pinna, × 10; E, F, *Diplazium plantaginifolium* (L.) (Brazilian material). E, stipe, × 10; F, midrib of the blade, × 10; G, H, *D. grandifolium* Sw. G, stipe, × 10; H, midrib of the blade, × 10.

The result is that, under the microscope, there is no such contrast between walls and lumina as is seen in the scales of *Asplenium*. Similar scales are found in *Cystopteris*, in *Dryopteris*, in *Diplazium* and in several other genera. In some species of *Athyrium* and in many species of *Diplazium*, the much reduced scales which occur along the rachis and veins of the frond, and especially in the axils of the pinnae, are somewhat clathrate, but the large basal scales, occurring on the rhizome and on the bases of the stipes are of the characteristic form just described.

In *Athyrium* and *Diplazium* the structure of the stipe and the rachis is rather uniform (see fig. 1). Two large bundles enter the base of the stipe. These may be nearly parallel, but more commonly they are somewhat inclined towards each other on the ab-axial

side of the stipe. They are usually well separated from each other and in a frond broken off at the base, they often project as two perfectly distinct fibrous cords. Taken as a whole, the xylem groups of the bundles are somewhat concave on their inner faces, though their central portion usually curves in the opposite direction. The tips of the xylem groups, and especially those facing the ad-axial side of the stipe are always sharply inflexed towards the middle of the stipe. These inflexed tips of the xylem may extend in at a sharp angle to the main mass of the xylem, in which case they are very conspicuous, or they may be completely inflexed, so as to lie closely applied to the inner face of the main xylem mass. Milde noted the existence of these inflexed parts of the bundle in those ferns in which they are conspicuous, but he seems to have overlooked the entirely parallel condition

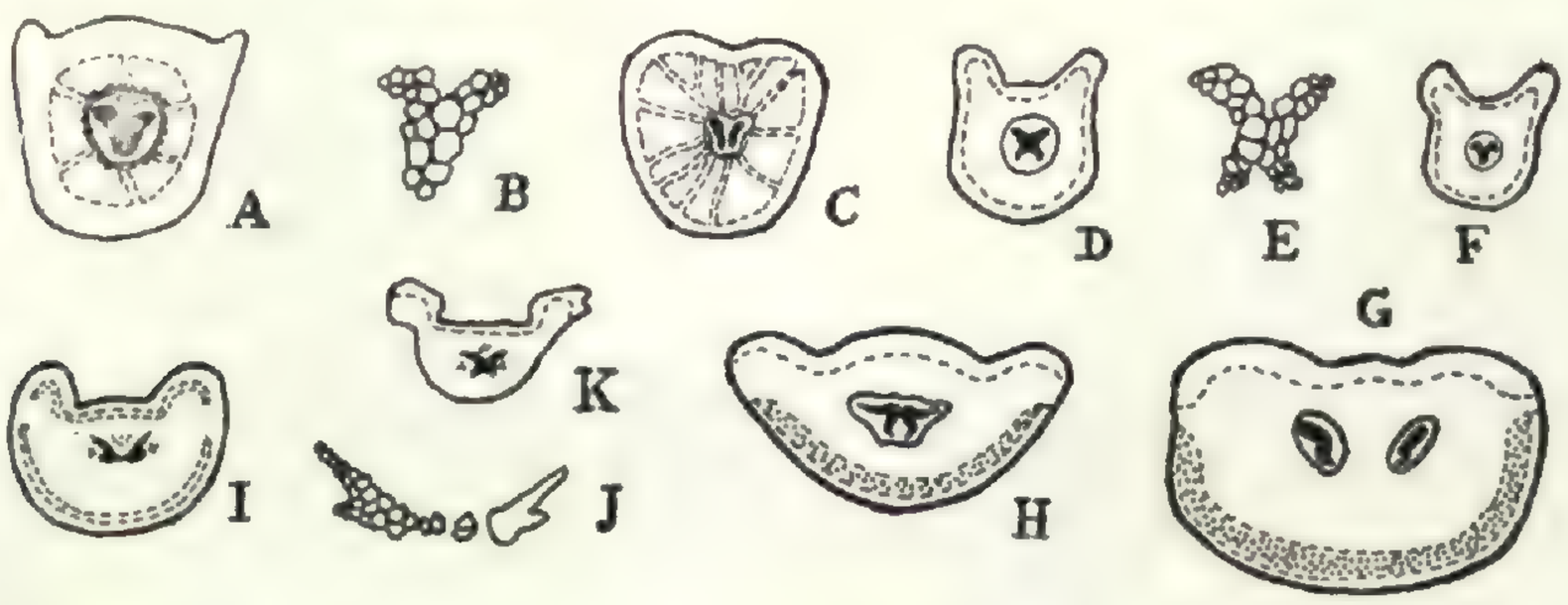

Fig. 2. Structure of the stipe in the genus *Asplenium*. A, B, *A. Trichomanes* L. A, stipe, × 10; B, detail of the xylem of A. C–F, *A. viride* Huds. C, base of stipe, × 10; D, upper part of the stipe, × 10; E, detail of the xylem of D; F, rachis of the frond, × 10; G, H, *A. bulbiferum* Forst. G, stipe, × 3½. H, rachis of the frond, × 3½. I–K, *A. fragrans* Sw. I, stipe, × 2½; J, detail of the xylem of I; K, rachis of the frond, × 5.

in such species as *Athyrium Filix-femina* in which the tips of the xylem are so much inflexed as to be almost hidden against the mass of the bundle. Sooner or later the two bundles unite by their dorsal extremities into a single U-shaped, or rarely V-shaped bundle. The structure of the stipe of *Dryopteris Thelypteris* (L.) A. Gray, *D. montana* (Vogler) Watt and other related species of *Dryopteris* is identical with that of *Athyrium*.

In *Asplenium* the vascular structure of the stipe is less uniform, and Milde recognizes four classes of structure in this genus, besides certain anomalous cases (see fig. 2). There are two small, centrally located bundles, which may be free throughout the length of the stipe and rachis, or may be united above, or even throughout.

When separate, they are more or less crescentic, with the convex side facing towards the middle of the stipe. The ad-axial tips of the bundles are never inflexed. When the two bundles are united, the compound bundle is usually X, Y, or T-shaped. Very rarely, as in *Asplenium fragrans* Sw. (*A. mexicanum* Mart. & Gal.) and *A. bipartitum* Bory (*A. auritum* Watt), the compound is V-shaped, but even then it is not entirely like that of *Athyrium*. Thus we find that in *Asplenium fragrans*, the compound bundle is formed, not by the union of the true ab-axial extremities of the component bundles, but by the junction of the points of narrowly V-shaped bundles (I and J, fig. 2).

There are certain minor points in which *Asplenium* nearly always differs from *Athyrium* and *Diplazium*. In the first mentioned genus, the walls of the sclerenchymatous cells of the stipe have a distinctly red color,— it is this which gives the characteristic red-black hue to the stipes of many species of *Asplenium*. In *Athyrium* and *Dilpazium* on the other hand, the sclerenchymatous cells of the stipe have yellow or yellow-brown walls. A similar difference obtains in respect to the thickened walls of the cells of the scales.

In *Asplenium* the veins of the ultimate segments tend to be repeatedly dichotomous, while in *Athyrium* and *Diplazium* the veins are pinnate, and the veinlets are either simple or once forked. Very rarely indeed in these genera is a vein forked twice.

The distinctions between *Athyrium* and the genera *Diplazium* and *Dryopteris* are based entirely on the character of the sorus. As has already been stated, this organ in *Athyrium* is very variable and in many species two, or even three distinct types of sorus occur, even on the same frond. The simplest of these types from the descriptive stand-point, though almost certainly not the most primitive, is that which is characteristic of the genus *Asplenium* (see fig. 3). Here the sorus extends for a greater or less distance along the anterior side of a vein,[1] and is covered by an indusium, which grows out from the

[1] When the subtending vein is forked or otherwise branched, the primary sorus occurs on the anterior side of the anterior branch of the vein. Secondary sori may occur on the posterior side of the anterior branch, and the anterior side of the posterior branch, and in corresponding positions on the other branches if there are any. It is to be noted that the secondary sori are always on the anterior side of the veinlets, if we consider their orientation in regard to the group of veinlets, viewed as an ultimate segment of the frond, rather than in respect to the segment of the next lower order, which controls the position of the primary sorus. As has been pointed out by E. J. Winslow (Double Sori in Athyrium, Am. Fern Journ. iii. 88, 1913), it is at such points of confused and indeterminate orientation that diplazioid and athyrioid sori especially tend to develop.

subtending vein and lies upon the sporangia. In the genus *Athyrium* such sori seem always to be in close contact with the subtending vein throughout their entire length, and never, as in some species of *Asplenium*, to curve away from it at the ends. Asplenioid sori vary greatly in length, but are otherwise quite uniform in character. The indusium is raised and pushed back by the developing sporangia, and at maturity is often completely reflexed.

The sorus characteristic of the great tropical genus *Diplazium* and found also in some species of *Asplenium* and *Athyrium*, consists of two

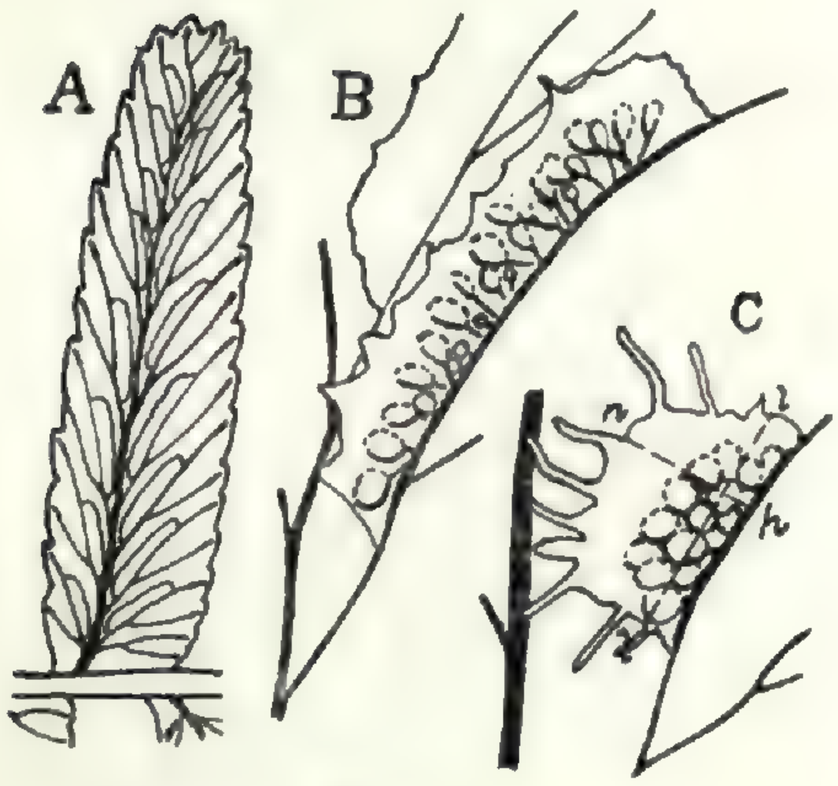

Fig. 3.

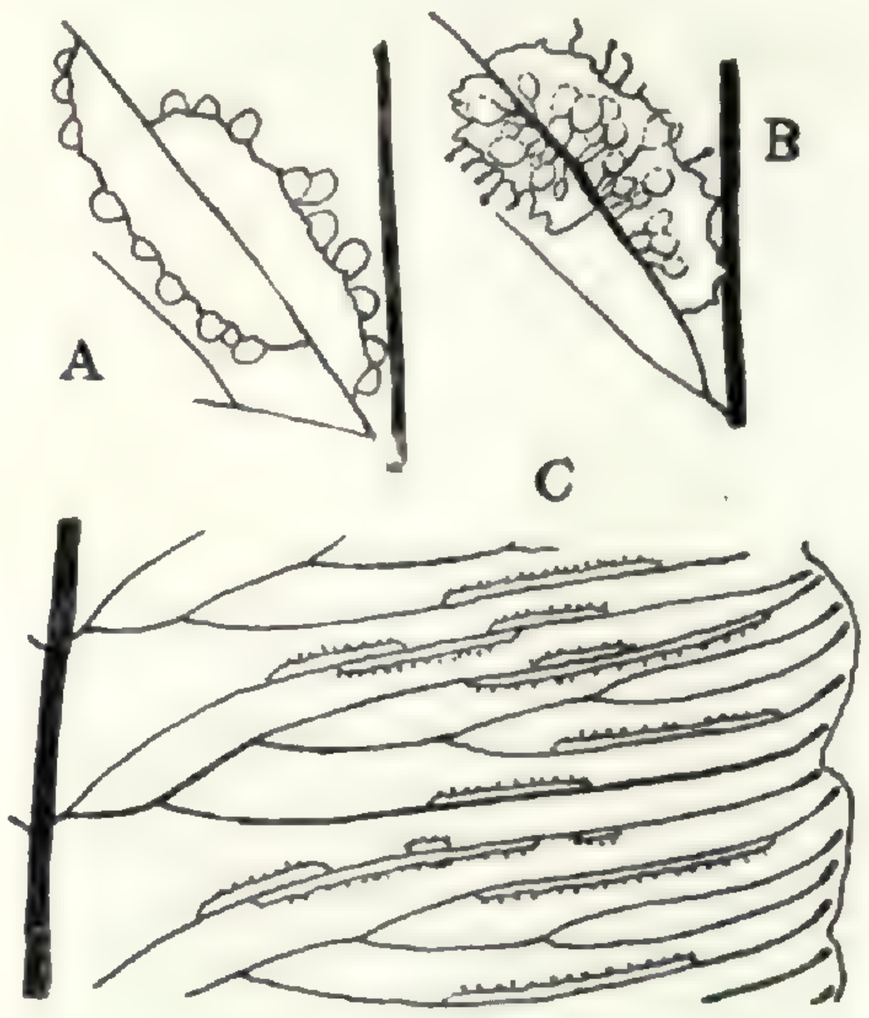

Fig. 4.

Fig. 3. Asplenioid sori. A, B, *Asplenium platyneuron* (L.) Oakes. A, pinna, × 2½; B, young sorus, × 10, the sporangia indicated as if seen through the transparent indusium. C, sorus from the distal portion of the pinnule of *Athyrium Filix-femina* (L.) Roth., l–l, line measuring the length of the indusium, h–h, line measuring its height.

Fig. 4. Diplazioid sori. A, *Diplazium acrostichoides* (Sw.) Butters, × 12½; B, *Athyrium asplenioides* (Michx.) Desv., × 12½; C, portion of the frond of *Diplazium plantaginifolium* (L.) Urban, natural size.

asplenioid sori standing back to back along the same vein (see fig. 4). Such sori may vary not only in their absolute length (in some species of *Diplazium* reaching over 2 cm.) but also in the relative length of the component parts. In general, the anterior sorus is longer than that on the posterior side of the vein. In typical *Diplazium* the indusia wither at maturity.

The characteristic athyrioid sorus may be described as an asplenioid sorus which at the distal end crosses the subtending vein (see fig. 5). Athyrioid sori display great diversity of form. At the distal

end, the sorus may barely cross the veins so as to be slightly hooked, a "hamate" sorus, or it may develop a considerable posterior limb, becoming horse-shoe shaped, or "hippocrepiform." In the latter case the two limbs may lie close together, or the posterior limb may lie at a visible distance from the subtending vein. Moreover, the entire sorus may be several millimeters long, or may be so short as to appear nearly round. In typical *Athyria*, the indusium of the mature sorus is reflexed wherever there is sufficient room, and at the curved distal end, it is crowded up into a vertical position in the midst of the sporangia. It is easy to see that the condition in a very short athyrioid sorus is but a brief step from that which obtains in such a fern as *Dryopteris Thelypteris* (L.) A. Gray, in which an essentially round sorus is covered by a centrally placed indusium shaped like an umbrella, but discontinuous on the proximal side. Finally, in a very short sorus, only that part may be present which crosses the vein, and the indusium may then also merely cross the vein, usually somewhat obliquely and just behind the sorus, a condition very like that found in the genus *Cystopteris*. Cystopterid sori are also fairly common in some of the more primitive species of *Dryopteris*, e. g. *D. Thelypteris* and its allies. In this connection it is interesting to note that Bower[1] considers *Cystopteris* as a relatively primitive type from which the *Aspidieae* have probably developed, and it seems equally probable that *Athyrium*, and through it the other genera of *Asplenieae* have developed from a similar origin.

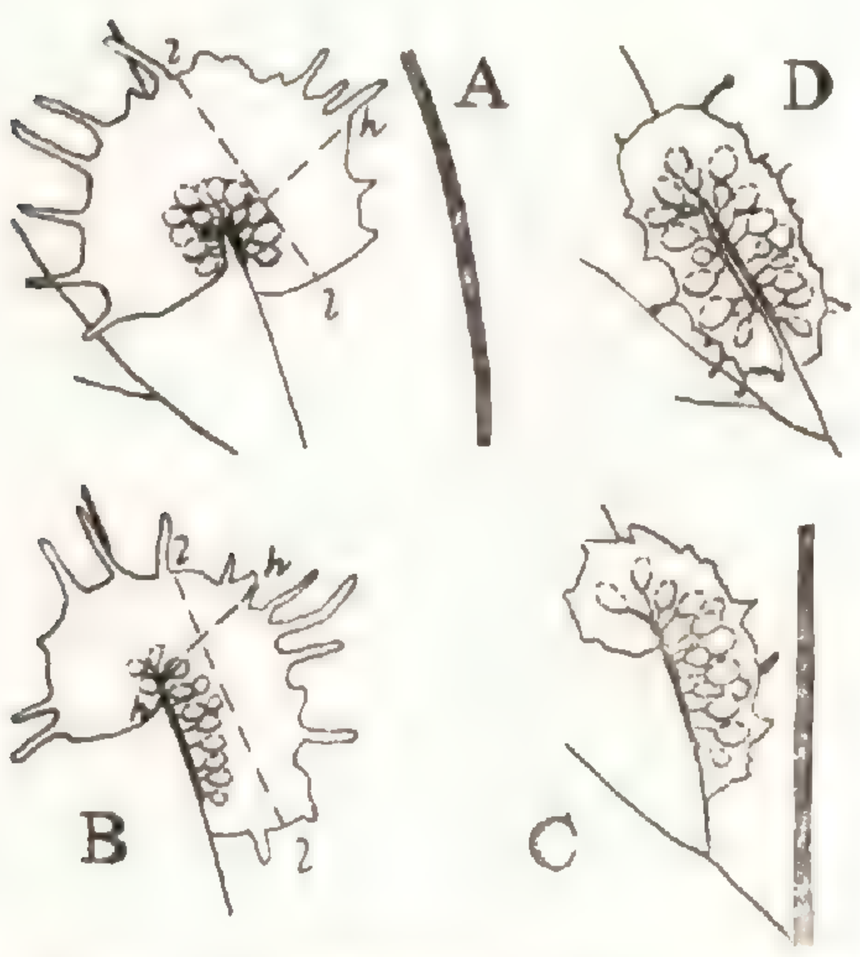

Fig. 5. Athyrioid sori. A, B, *Athyrium Filix-femina* (L.) Roth, l–l, length, h–h, height of the indusium. C, *A. angustum* (Willd.) Presl. D, *A. asplenioides* (Michx.) Desv. A and D are hippocrepiform, B and C, hamate.

It is readily seen, that with such variability of the sorus, it is not easy to define the limits of the genus *Athyrium*. In this connection there are two major problems, the limit between *Athyrium* and *Dryopteris*, and the question of the genus *Diplazium*.

[1] Bower, F. O., The Origin of a Land Flora, 615 (1908).

As Copeland has well pointed out,[1] *Athyrium* and *Dryopteris* are both relatively primitive genera of *Polypodiaceae*, presumably with a common origin, and between the more undifferentiated species of the two genera there is really no definable difference. In both groups, species occur with small hippocrepiform, round and cystopterid sori mingled on the same frond, and it becomes necessary to judge such cases, each on its individual merits. Thus *Athyrium mongolicum* (Franch.) Diels, which has many cystopterid and dryopterid sori mingled with other athyrioid ones is more closely allied to the *Filix-femina* group of *Athyria*, than to any species of *Dryopteris*, while *Dryopteris Schaffneri* (Fée) C. Chr., with a similar assortment of sori, is obviously a member of the somewhat specialized section *Goniopteris* of the genus *Dryopteris*. Similarly, in one of the species discussed in this paper, *Athyrium alpestre* (Hoppe) Rylands, evidence from the sori is at best very slight, and in some of its forms, as, for example, that found in America, such evidence is entirely wanting, yet, so closely do some of its forms approach to certain forms of the common lady fern, that the two species can scarcely be kept separate, and there can be no question of the generic position of *Athyrium alpestre* in any natural classification of ferns.

In this connection, it is well to note that Christensen [2] has found the type of pubescence very useful in classifying ferns of the genus *Dryopteris*, and it bids fare to be equally useful in delimiting the groups of the genera *Athyrium* and *Diplazium*, and in indicating the true affinities of certain anomalous species.

In the direction of *Diplazium* the limits of the genus *Athyrium* are even harder to define. As stated above, Milde [3] decided finally that this is an impossible task, and he then merged the two genera, while Copeland holds [4] that the Asiatic *Diplazia* have had a multiple origin from the typical *Athyria*, and therefore cannot properly be regarded as constituting a genus. The Asiatic forms of *Diplazium*, and of *Athyrium* also, are certainly much more complex in their relationships than the American forms, and the final settlement of this question will depend on a careful working out of the lines of evolution of the

[1] Copeland, E. B., A Revision of the Philippine Species of Athyrium. Philip. Journ. of Sci. Bot. iii. 285 (1908).

[2] Christensen, C., On a natural Classification of the species of Dryopteris. Biol. Arb. tileg. Eug. Warming (1911).

[3] Milde J., Ueber Ath. etc., Bot. Zeit. xxviii. 329 (1870).

[4] Copeland, E. B., loc. cit.

Asiatic groups. As both of the genera involved are already of considerable size,— according to Christensen's Index, *Athyrium* has 85 valid species, and *Diplazium*, 206,— a merging of them seems undesirable unless it is absolutely required by considerations of taxonomic honesty. So far as American ferns are concerned, the author finds that *Athyrium acrostichoides* (Sw.) Diels shows, in the thickened walls of the cells of its indusium, and in its pubescence, far closer kinship for the ordinary type of tropical American *Diplazium*, than for ferns of the lady fern group, and the same is true of *Athyrium angustifolium* (Michx.) Milde.[1] It seems that it may be possible eventually, to limit the genus *Athyrium* to the lady fern and its immediate allies, and possibly to form two or more genera out of the more remote groups of *Athyria* and *Diplazia*, but careful monographic work upon the whole complex is very much needed at the present time.

Finally it appears that the contact between these ferns and the true *Asplenia* is through once pinnate (or possibly entire leaved) tropical forms such as *Diplazium semihastatum* (Kze.) C. Chr. and *Asplenium bipartitum* Bory, as it is only among ferns of this general type, that any forms with intermediate vascular structure occur. While the larger, 2–3 times compound *Asplenia* sometimes closely simulate certain species of *Athyrium*, the structural differences are always perfectly sharp and clean cut.

The close resemblance of the western ferns commonly classified as *Athyrium cyclosorum* to certain European forms of *A. Filix-femina*, led to an examination of all the American and old world material of these species in the Gray Herbarium. From this examination certain conclusions were reached, which are discussed at length below. These conclusions are as follows:

1. That in the eastern United States and Canada there are two distinct species of lady ferns, neither of which is conspecific with *A. Filix-femina* (L.) Roth of Europe. One of these two species, *A. asplenioides* (Michx.) Desv. is prevailingly southern in its distribution, the other, *A. angustum* (Willd.) Presl, is prevailingly northern.

2. That the ferns of the northwest are conspecific with the Euro-

[1] In the opinion of the author these ferns should be known as **Diplazium acrostichoides** (Sw.), comb. nov. (*Asplenium acrostichoides* Sw. Schrader's Journal 1800, ii. 54 (1801), *Asplenium thelipterioides* Michx., Fl. Bor.-Am. ii, 265 (1803), *Diplazium thelipteroides* Presl, Tent. Pterid. 114, 1836) and **Diplazium angustifolium** (Michx.), comb. nov. (*Asplenium angustifolium* Michx., Fl. Bor.-Am. ii, 265, 1803).

pean plant, but, in some cases, differ from the common European forms of *A. Filix-femina* in certain minor points, and are then best regarded as a geographical variety of that species.

3. That the lady ferns of California, and the southern Rocky Mountains differ more markedly from the European plant, but are not clearly distinct from the more northern form, and therefore are best considered as a second, and much more aberrant geographical variety of *A. Filix-femina.*

4. That a boreal and high alpine fern found in eastern Quebec and in the alpine areas of western North America, is a clearly distinct geographical variety of the old world *A. alpestre.*

2. Athyrium Filix-femina (L.) Roth.[1]

Since the conception of this species among American botanists seems to have become considerably confused by the failure to distinguish it from the related forms of eastern America, a brief account of its chief characteristics seems desirable. The following description has been drawn up mainly from the specimens of the European plant in the Gray Herbarium (about twenty-five in number), together with a careful comparison with the standard works on British and continental ferns.

The rhizome is generally described as erect, sometimes as erect or ascending, rarely as decumbent. Even in cases where it is not entirely erect, there appears to be always, a distinct upright crown of fronds, with the young growth in their midst.[2]

[1] *Polpodium Filix femina* L. Sp. Pl. ii. 1090 (1753). *Athyrium Filix Foemina* Roth ex Mertens, Archiv für die Botanik, ii. pt. 1, 106 (1799). *Athyrium Filix femina* Roth, Tent. Flor. Germ. iii. 65 (1800).

[2] The character of the rhizome is in general poorly shown in herbarium material. In the Gray Herbarium only two European plants of this species show the crown of the rhizome. One of these from Holstein, has the rhizome ascending at an angle of about 70°, the other, from Saxony, at an angle of about 45°. An Algerian specimen has the rhizome ascending at an angle of about 60°, and curving upward. In all these specimens the young growth is surrounded by the bases of the older fronds.

In this connection the testimony of certain European writers is interesting. Thus Newman, Hist. of Brit. Ferns, ed. I. 62 (1840), says "The Rhizome is vertically elongate, sometimes rising several inches above the surface of the ground: in one instance I have seen it more than a foot in height, thus evincing a considerable proximity to the Dixoniae, and other tree ferns," and Moore, Popular History of British Ferns, ed. I. 87 (1851), states, "The habit of the plant is tufted, the caudex of the larger varieties often with age acquiring some length, and elevating the circlet of fronds on a low, rude pedestal; this stem, however, never acquires more than a few inches in length. In winter, the summit of this stem, whether a tuft seated close to the ground, or elevated a few inches above the surface, is occupied by a mass of incipient fronds, each rolled up separately, and nestling in a bed of chaffy scales," while Milde, Die Gafäss-Crypt. Schles. 570 (1858), speaks of the "ganz aufrechten oder wenig aufsteigendem Rhizome."

The crown of the rhizome and the lower one-third of the stipes are covered rather densely, and the upper portions of the stipes more sparingly, with large rather persistent scales. These are sometimes over 1 cm. long, and up to 3 mm. wide, lanceolate, and contracted to a narrow base, so that in falling one leaves a very small scar which is almost round or like a minute inverted U. The scales are translucent and glossy, so that it is difficult to evaluate their true color. Seen against a white background, e. g. an herbarium sheet, they generally correspond to the "tawny" or "russet" shades of Ridgway's Color Standards, Plate 15. Very rarely they are darker, approaching Ridgway's "Mars Brown." The cells of which they are composed are large enough to show plainly with a hand-lens of moderate power, and under a compound microscope appear as elongated, but scarcely fibrous cells about six times as long as they are wide.

The stipes are commonly very short, one-fourth to one-third as long as the frond. The fronds themselves are lanceolate, widest in the middle, and tapering about equally in both directions. The lower pinnae are rather remote, in general strongly deflexed, and, though but little reduced in width, only one-fourth to one-half as long as the middle pinnae.

In the details of the arrangement, form and cutting of the pinnules, this species, like all of its close relatives, is very variable, and innumerable "varieties" have been named, sixty five of which are enumerated and described by Moore in his "Nature Printed British Ferns." [1]

The sori differ considerably in different specimens, and different parts of the same specimen, but have certain general characters which distinguish them clearly from those of the east American plants of this group (see Plate 123, figs. 1 and 2, also text-fig. 3, p. 175 and text-fig. 5, p. 176). They are uniformly short, very rarely reaching the length of 1 mm. Strictly asplenioid sori are rare, and are usually found only at the distal extremity of the pinnules, where the sori are considerably reduced in size. A very common form is the sorus which runs along the anterior side of the subtending vein for about 0.75 mm., and then crosses it without extending at all down the posterior side of the vein. In many specimens, horse-shoe shaped sori, and even round sori are found. In sori of the latter types, the indusium is

[1] Good figures, showing the general aspect of this fern may be found in the work just mentioned, Folio ed. pl. 30–34, 8vo. ed. pl. 52–66, in Lowe, E. J., Our Native Ferns, pl. 35, also in his Ferns British and Exotic, v. pl. 29, and in Schkuhr, Ch., Kryptogamische Gewächse, pl. 58.

bent sharply back upon itself, with the two sides in contact, so that it stands in the midst of the sporangia of the distal half of the sorus.

The indusia are usually provided with an abundance of long multicellular cilia. These are occasionally rather few in number, and in old sori they often become so shrivelled that they are not easily seen, except with the compound microscope, and after careful dissection. In no specimen examined were they wanting. The average height of the indusia, not including the cilia, is 0.55 mm., and their average length in the larger sori is 0.8 mm.[1] In the case of the short asplenioid sori near the tips of the pinnules the indusium is often higher than it is long. At both extremities the indusium ends abruptly, so that its sides meet the line of attachment nearly perpendicularly, and sometimes it is even contracted towards the base.[2]

The stalks of the sporangia are short and very frequently proliferate, the branch usually bearing a secondary sporangium. Occasionally the secondary sporangium is abortive, and rarely it is replaced by a glandular structure. In no specimen seen are such glands freely and uniformly produced as they are in nearly all east American material.

The spores are yellowish, sparsely papillate, and average 39.1 × 24.1 μ in size.

3. The Lady Ferns of the Eastern United States and Canada.

In the eastern parts of North America there are two species of the lady fern group which appear to be amply distinct from each other and from the true *Athyrium Filix-femina*. These are *A. asplenioides* (Michx.) Desv. and *A. angustum* (Willd.) Presl. The former is a southern species, ranging from Florida to Texas, and north to Missouri, Indiana, Ohio, and along the Atlantic coast to eastern Massa-

[1] All measurements of indusia in this paper were made upon indusia dissected off from the frond and flattened out under a cover glass. The length is always measured in a straight line, as nearly as possible parallel to the line of attachment of the indusium, the height in a straight line from the attached edge of the indusium to its free margin. See text-figure 3, p. 175, and text-figure 5, p. 176.

[2] The soral characters of the true *A. Filix-femina* are reflected in the treatment of it by European botanists. Thus Linnaeus, who defined *Polypodium*, "Fructificationes distributae in puncta rotunda, per paginam folii aversam (Gen. Pl. ed. 5, 485, 1754), placed the lady fern in that genus between *P. cristatum* and *P. Filix-mas*, and *P. aculeatum*, *P. rhaeticum* (a mixture of *Athyrium Filix-femina* and *A. alpestre*) and *P. noveboracense*. It has been placed in *Nephrodium* and *Aspidium* and by most recent European botanists in *Athyrium*. Those who, like Mettenius and Hooker placed it in *Asplenium* have held very broad views of the extent and characteristics of the latter genus.

chusetts, the latter is a northern species ranging from Labrador to Manitoba, and southward to southern New England, the mountains of Pennsylvania, the region of the Great Lakes, northern Missouri and the Black Hills. The two species meet chiefly in southern New England.

In both of these species the rootstock is horizontal or nearly so, and the young growth appears at the end, in advance of the bases of the older fronds, instead of surrounded by them as in *A. Filix-femina*. At the same time the two species differ considerably from one another in their underground parts. *A. asplenioides* has the rootstock distinctly creeping, and only partially and incompletely covered by the short persistent bases of the fronds, the whole structure being only 1–1.5 cm. in diameter. The fronds of each season's growth are loosely clustered, and the next season's growth projects conspicuously beyond the bases of the fronds of the current season. *A. angustum* has a much more condensed rootstock completely covered by the long overlapping fleshy persistent bases of the fronds, the whole structure being 2–5 cm. in diameter. The fronds are usually produced in considerable numbers, and as the rootstock grows but slowly, they are bunched together, but not truly tufted or forming a crown as in *A. Filix-femina*. The new growth stands in front of the fronds of the current season, but does not project conspicuously as in *A. asplenioides*.[1]

The young growth of *A. asplenioides* is covered with scales which are smaller and proportionally narrower than those of *A. Filix-femina* but similar in color and structure. In the American fern, however, these scales are for the most part quickly deciduous after growth starts, and the stipes and bases of the mature fronds show very few scales, and these commonly of very small size (3–5 mm. long, by less than 1 mm. wide).

[1] I have laid particular emphasis on this point because D. C. Eaton, Ferns of the Southwest, U. S. Geog. Surveys West of the 100th Meridian, vi. 330 (1878), says, "Moore separates the greater part of the North American ferns specifically under the name of *Athyrium asplenioides*, Desv., making two varieties, one with broader and one with narrower pinnules, but the distinctive character which he relies mainly upon, the 'creeping caudex,' seems to be invalid, as our American plants grow in crowns no less decidedly than those of Europe." The context shows that Eaton was not confining these remarks to the western ferns, which are truly tufted, but that he entirely ignored the difference between the close crowding of leaves due to a very slow horizontal growth of the rootstock, and the true crown which arises when the growth is vertical or nearly so. Certainly the quotations in the footnote on p. 179 are very far from describing the condition of the rootstock in either of our east American species. It is noteworthy that all European botanists who have been dealing with living American plants in cultivation have noted the difference in the underground parts between these plants and *A. Filix-femina*.

The scales of *A. angustum* are quite different from those of either of the other species just mentioned. They are of moderate size (up to 1 cm. long and 1.5 mm. wide, usually considerably shorter than this). In shape they are narrowly linear-lanceolate with a fairly wide base, and in falling they leave larger and more conspicuous scars than do the wider scales of *A. Filix-femina.* They are much more opaque than those of the last mentioned species, and generally of darker color, varying from the "Mars Brown" of Ridgway's Color Standards, Pl. 15, to nearly black, with the middle often darker than the edges. Under a moderately strong hand-lens it is difficult to make out any structure, while under a compound microscope, they are seen to be composed of narrow fibrous cells about 15 times as long as they are wide.

In the form of the frond, the two American ferns are decidedly dissimilar. *A. angustum* closely resembles *A. Filix-femina,* but its stipes are commonly proportionally longer,— often one-half as long as the fronds,— and the lower pinnae are not quite so much reduced in size, and are less strongly deflexed than in that species.

A. asplenioides has still longer stipes, about equalling the narrowly deltoid lanceolate fronds. The second pair of pinnae are commonly the longest, and the basal pinnae are only very slightly reduced in length.

The details of the fronds of both American species are, as in *A. Filix-femina,* very variable, but the following points are worthy of note: the fronds of *A. angustum* are often markedly dimorphic, the segments of the fertile fronds being much narrower and more acute than those of the sterile fronds; the pinnules of the fertile fronds of *A. angustum* are commonly narrowly lanceolate and acute, those of *A. asplenioides,* oblong or linear-oblong and obtuse (in very large fronds, however, the pinnules may be deltoid-lanceolate and sub-acute, and the segments of the third order oblong and obtuse.[1]

In the structure of the sori and indusia, the two east American species are markedly different from *A. Filix-femina* and from each other. The sori in both American species are prevailingly asplenioid and for the most part over 1 mm. in length, those of *A. asplenioides* being longer than those of *A. angustum.* Athyrioid sori are generally

[1] For a discussion of the various forms and varieties of *A. asplenioides* and *A. angustum,* see below, p. 188 et seq. For illustrations of the pinnules of the various forms of these species see Plate 123, figures 3–18.

either long sori, rather sharply hooked at one end (hamate), or else long horse-shoe shaped, while the short and almost round type so commonly found in *A. Filix-femina* is very uncommon. Diplazioid sori are somewhat rare, but are more common than in *A. Filix-femina* (see Plate 123, figs. 4, 6, 11, 13 and 16, also text-figs. 3–5, pp. 175, 176).[1]

The indusium of both American species is broadest at the base, and is often markedly decurrent along the subtending vein. The margin of the indusium of *A. angustum* is usually toothed, or furnished with a few short one-celled cilia (Plate 123, fig. 17). Rarely, especially in the later fronds of the season, it has a few longer, multicellular cilia similar to those found in *A. Filix-femina.* The indusium of *A. asplenioides* is ciliate with multicellular hairs which have swollen glandular tips of a yellow-brown color, a character which is conspicuous under the compound microscope in the recently matured indusium, but is sometimes difficult to demonstrate in over mature specimens, in which the cilia are often broken (Plate 123, fig. 8). The indusia of the largest sori in *A. angustum* measure on the average, 0.5 mm. high, by 1.1 mm. long, those of *A. asplenioides* 0.45 mm. high, by 1.3 mm. long. Even the small sori toward the tips of the pinnae never have indusia higher than they are long.

In *A. asplenioides* the stalk of the sporangium bears a yellowish, long-stalked, glandular body (Plate 123, fig. 9). In *A. angustum,* similar glands are common but by no means as uniformly present as in *A. asplenioides,* and sometimes the stalks of the sporangia proliferate and bear secondary sporangia as in *Filix-femina.*

The spores of *A. angustum* resemble those of *A. Filix-femina;* their average size is 38.6 × 24.7 μ. The spores of *A. asplenioides,* on the other hand are furnished with a nigrescent, wrinkled or reticulate exospore, and resemble rather the spores of *A. alpestre* of arctic-alpine Europe and America. Their average size is 36.0 × 25.5 μ (Plate 123, figs. 10 and 18).

It will be seen, therefore, that the two species of lady ferns of the eastern states and Canada differ from each other and from *A. Filix-femina* in characters of rootstock, scales, fronds, sori, indusia and spores.

The history of the treatment of these ferns by botanists, American

[1] Asplenioid sori in the American species, particularly the rather long ones of *A. asplenioides,* are somewhat curved, or "lunate," with the convex side facing away from the subtending vein. The amount of this curve depends chiefly on the absolute length of the sorus. It is not to be confused with the sharp bend which occurs in athyrioid sori.

and foreign, is interesting and somewhat illuminating. Prior to the work of Michaux, no mention is made of the American occurrence of any species of this group. Michaux assigns two species to eastern North America, describing one as "*Nephrodium Filix foemina*," with the habitat "Canada," and the other as "*Nephrodium asplenioides*," with the habitat "from New England to Carolina." [1]

The following year, Sprengel [2] described *Asplenium Athyrium* apparently from slightly different material of the same species which Michaux had called *Nephrodium asplenioides*. He states that he gives it this name because it has the greatest similarity to *Athyrium Filix-femina*, and ends his description, "Ich vermuthe dass dies Michaux *Nephrodium asplenioides* ist." These two names have been treated as synonyms by all subsequent botanists. In 1809, Schkuhr,[3] after publishing a description of *Asplenium Athyrium*, with an excellent plate, had a change of heart and added the statement "aber nach andern Beobachtungen an mehrern aus Amerika erhaltenen Exemplaren kann ich solchen jetzt von *Aspid. Filix fem.* nicht unterscheiden; selbst an unserer deutschen Pflanze dieses weiblichen Farn habe ich noch weit grössere Abänderungen gefunden, die von einigen als verschiedene Arten betrachtet werden."

In 1810 Willdenow [4] adopted Michaux's species, treating it as *Aspidium asplenioides*, and citing as synonyms both the *Nephrodium asplenioides* of Michaux and the *Asplenium Athyrium* of Sprengel. He says of it, "A sequenti [*A. Filix-femina*] praeter forman frondis parum diversum, soris lunatis abunde distinctum." He introduces a change into the description, saying, "pinnulis lineari-lanceolatis inciso-dentatis," a change which is certainly not in the direction of greater accuracy, and which seems to have lead to considerable confusion. Willdenow gives the habitat of "*Aspidium Filix femina*" as

[1] Michaux, Fl. Bor.-Am. ii. 268 (1803). The original description reads: [Nephrodium] ASPLENIOIDES. N. majusculum, glabrum: stipite nudo: fronde bipinnata; pinnulis subovali-oblongis, inciso-dentatis; dentibus inferioribus obtusis, supremis mutice acutis: punctis utrinque juxta nervum lunatis.

Obs. Affine POLYP *Filici foem.* et forsan varietas. Puncta maturitatem quasi lineolae plerumque arcuatae; .ita ut proximitatem as ASPLENIUM indigitent.

HAB. a Nova Anglia ad Carolinam.

This description and the range given apply distinctly to the more northern of our two eastern species. A fragment in the herbarium of the New York Botanical Garden, consisting of two pinnules labelled "from Herb. Michx. Poly. asplenioides a Nova Anglia ad Carolinam" confirms this application of Michaux's name.

[2] Sprengel, K., Anleit. zur Kent. der Gew. iii. 113 (1804).

[3] Schkuhr, Ch., Kryptogamische Gewächse, 72 (1809).

[4] Willdenow, C. L., Sp. Pl. v. 276 (1810).

"Europe," and describes a third species, *Aspidium angustum*, founding it upon the fern called by Michaux, "*Nephrodium Filix foemina.*" [1]

Almost immediately after Willdenow had thus cleared up the status of the American lady ferns, Pursh [2] introduced an element of confusion. He lists *Aspidium asplenioides* and *A. angustum*, quoting Willdenow's short diagnosis of each, and between them inserting *A. Filix-femina* with Willdenow's diagnosis of that species and the statement, "In low shady grounds: Canada to Virginia. July 2ɬ. v.v." He also says of *A. asplenioides*, "A tall species much resembling the following in many respects," and of *A. angustum*, "Resembling the following."

The history of the treatment of these ferns by American botanists during the next twenty-five years, was largely a series of attempts to fit the existing plants into the three species as outlined by Pursh. In these attempts reliance seems to have been placed almost entirely on the form and details of the fronds, while the real distinctions were ignored. It is accordingly often difficult to ascertain what species or form any particular author had in mind when he used a certain name. This confusion is especially evident if one compares, for example, the various editions of Amos Eaton's Manual of botany.[3]

[1] Willdenow, loc. cit. 277. The original description reads:

129. ASPIDIUM *angustum* W.

A. frondibus bipinnatis, pinnulis lanceolatis inciso-serratis, serraturis subbidentatis, infima superiore elongata, soris oblongis sublunatis. W.

Nephrodium (*Filix femina*) majusculum * * * * * *Mich. amer.* 2. p. 268.

Schmallaubiger Wurmfarrn. W.

Habitat in Canada. 2ɬ. (*v. s.*)

Stipes *glaber*. Frons *oblonga bipinnata pedalis et altior*. Pinnae *sesqui- seu bipollicares lanceolatae valde acuminatae alternae*. Pinnulae *trilineares subopppositae lanceolatae acutae inciso-serratae*. Serraturae *breves obtusiusculae indivisae vel bidentatae, infima superior reliquis longior*. Sori *oblongi parum lunati. A. praecedente* [*A. Filix-femina*] *satis distincta*, circumscriptione *frondis oblonga multo angustiore*, pinnis *magis acuminatis*, serratura *infima superiore pinnulae majore*, soris *non rectis sed leviter lunatis*. W.

It is evident that Willdenow was describing a very small sun-form of our northern species. Specimens in the Gray Herbarium collected by C. G. Pringle in the province of Quebec in 1879 and 1880 correspond entirely to this description, nearly all others are larger.

[2] Pursh, F., Flora Am. Sept. 664 (1814).

[3] It may be noted that a few American botanists refused to follow Pursh's lead. Thus Jacob Bigelow, in his Florulae Bostonensis (p. 254, 1814) lists only "*Aspidium asplenioides* Muhl." [sic], though his description, evidently drawn from actual material, indicated that he was dealing with one of the larger forms of *A. angustum*, and he persisted in this treatment of the ferns about Boston throughout the three editions of his work. The Pennsylvania botanists, Barton and Darlington (Barton, W. P. C., Compendium Florae Philadelphiae, ii. 209. 1818. Darlington, Wm., Flora Cestrica ed. 2, 579. 1837.) listed only a single species, *Aspidium asplenioides*. Darlington gives a good original description which indicates that he had named the species correctly. Unfortunately, in his third edition (1853) evidently under the influence of Hooker and Gray, he changed the name to *Asplenium Filix-foemina* R. Br.

The next stage in the treatment of the North American lady ferns, is that represented by the work of W. J. Hooker, Asa Gray and D. C. Eaton. Hooker at first [1] reduced all the lady ferns of British North America, eastern and western, to *Athyrium Filix femina* with variety β (*Aspidium angustum* Willd.) and var. γ of the northwest coast. In both the typical species and his var. β he included western as well as eastern forms. He later [2] transferred the species to *Asplenium*, and discarded all varieties. In his Species Filicum he says, "I do not find any of the N. American forms to differ essentially from the European."

American authors since Hooker's time have generally followed him pretty closely. Thus in the first four editions of Gray's Manual 1848–1863) we find beneath the description of "*A*[*splenium*] *Filix-foemina*," the following explanation: "(*Aspidium Filix-foemina* and *asplenioides* Swartz.) — A narrow form is *Aspid. angustum*, Willd. Moist woods, common. July." In the fifth edition (1869) the concluding sentence is changed to "moist woods, common and very variable. July. (Eu.)", while in the sixth edition (1890, Watson and Coulter), the synonymy disappears entirely, and the description is followed merely by the statement, "Moist woods; common, and presenting many variable forms. July. (Eu.)." The only change in the seventh edition (1908, Robinson and Fernald) is the substitution of the word "cosmop." for "Eu.".

Likewise in the earlier editions of Wood's Class Book, under "A[*splenium*] *Filix-foemina* Bernh." are cited the synonyms, "*Aspidium Filix-foemina* and *asplenoides* [sic] Sw. *A. angustum* W.", but beginning in 1861, these names disappear even as synonyms. D. C. Eaton [3] reduces all North American lady ferns to "Asplenium Filix-foemina." He says, "The so-called varieties of this fern are almost innumerable, but all pass into one another by various gradations. The chief forms occurring in North America are the following." He then enumerates and describes vars. *exile*, *angustum*, *latifolium*, *commune* and *cyclosorum*. His chief illustration (pl. 76, no. 1) is drawn from a specimen of *Athyrium asplenioides*.

European botanists have generally kept the east American ferns as species distinct from *Athyrium Filix-femina*, the most notable excep-

[1] Hooker, W. J., Flor. Bor.-Am. ii. 262 (1840).
[2] Id. Species Fil. iii. 219 (1860).
[3] Eaton, D. C., Ferns of N. A. ii. 225 (1880).

tions being Mettenius [1], who reduced them to varieties, and Hooker, who as noted above finally discarded them entirely. Milde, in some of his earlier publications [2] identifies "*Asplenium Michauxii*" (*Athyrium angustum*) with the European *A. Filix-femina*, but in his Filices, he does not include the names of the American ferns in the synonymy, of *A. Filix-femina*, and under the treatment of that species, he makes the following enlightening statement:

"The American plant, very similar in habit to the European, produces several forms which seem to be wanting in Europe. a) I have found smooth yellowish spores, in others ridged and blackish. b) Indusia sometimes fimbriate, sometimes furnished with cilia ending in large hyacinthine glands. Generally I have found stalked glands also intermixed with the sori. c) The blade beneath is either glabrous, or covered with long, cylindrical, obtuse, 1–2 celled hairs. Here belong: *Athyrium asplenioides* Fée and Presl (*Aspidium* Sw.— *Asplenium Athyrium* Sprengel) and *Athyrium Michauxii* Fée (*Asplenium* Spr.— *Aspidium angustum* Willd.— *Asplenium elatius* Link). The American plant is worthy of more accurate examination from various regions." [3]

Synoptical Treatment of the Lady Ferns of Eastern North America.[4]

A. Rhizome creeping, not densely covered with persistent bases of the fronds; scales of stipes very few, seldom persistent, rarely over 4 mm. long, their cells relatively broad and with pale walls; frond widest near the base; indusia ciliate, the cilia ending inglands; spores nigrescent, reticulate or wrinkled.

[1] Mettenius, G., Über einige Farngat. vi. Asplenium, 199 (1859).

[2] Milde, J., Die Gefäss. Crypt. in Schles. 575 (1858).

[3] Planta Americana habitu Europaeae simillima formes complures procreat, quae in Europa deesse videntur. a) Sporas flavas laeves, in aliis formas subnigras verrucosas inveni. b) Indusia nunc fimbriata, nunc ciliis in glandulas magnas hyacinthinas exeuntibus instructa. Glandulae stipitatas etiam soris immixtas interdum inveni. c) Lamina subtus aut glabra est, aut pilis longis cylindricis, obtusis, 1–2 cellularibus obsita est. Huc pertinent: Athyrium asplenioides *Fée* et *Presl.* (— Aspidium *Sw.*— Asplenium Athyrium *Sprengel*) et Athyrium Michauxii *Fée* (Asplenium *Spr.*— Aspidium angustum *Willd.*— Asplenium elatius *Link*). Planta Americana digna est, quae ex diversissimis regionibus accuratius examinetur. Milde, J., Filices Europae et Atlantidis, 52 (1867).

[4] The variety of *Athyrium alpestre* which occurs in a few alpine situations in the Gaspé peninsula, is treated fully with the lady ferns of western America. It is readily distinguished from any other eastern species of *Athyrium* by the exceedingly narrow segments of the frond, and by its small round sori, entirely without indusium.

ATHYRIUM ASPLENIOIDES (Michx.) Desv.

Nephrodium asplenioides Michx. Flor. Bor.-Am. ii. 268 (1803).

Asplenium Athyrium Spreng. Anleit. iii. 113 (1804).

Athyrium asplenioides Desv. Prod. 266 (1827), (Mem. Soc. Lin. Paris, vi.).

Icones: Schkuhr, Krypt. Gew. plate 78; Eaton, D. C., Ferns of N. A. ii. plate 76, fig. 1–3; Lowe, Ferns Br. and Ex. v. plate 37.

The following two forms of this species may be recognized:

B. Pinnules under 15 mm. long, oblong to oblong-linear, obtuse.
A. asplenioides f. *typicum*.[1]

In the Gray Herbarium all specimens of lady ferns from south of the Potomac and Ohio Rivers, and the state of Missouri are of this species, and all except those noted below under the forma *subtripinnatum* are of this, the typical form. The following are specimens of *A. asplenioides* f. *typicum* from more northern states:

MASSACHUSETTS: Waltham, July 27, 1901. *W. P. Rich* (N. E.[2]); Quaker Leonard Road, Brockton, September 8, 1907, *A. A. Eaton;* Sandwich, July 28, 1909, *E. W. Sinnott* (N. E.).

RHODE ISLAND: Cranston, July 14, 1884, *J. F. Collins;* near Harbor Pond, Block Island, September 13, 1913, *Fernald, Hunnewell and Long* no. 8339; Foster, September 11, 1910, *G. S.* and *K. A. Torrey* (N. E.); near Swamp Hill Reservoir, Lincoln, August 8, 1885, *J. F. Collins* (N. E.).

CONNECTICUT: Bridgeport, July 7, 1889, *C. K. Averil* (N. E.); woods north of Cave Brook, Guilford, August 4, 1882, *Wm. R. Dudley* (N. E.); Danbury, July 19–20, 1912, *E. J. Winslow* (N. E.); without locality, *D. C. Eaton.*

NEW YORK: Bedford Park, New York City, August 14, 1900, *Percy Wilson;* Staten Island, July 28, 1905, *Philip Dowell* no. 3962.

PENNSYLVANIA: Lily Lake, Lucerne Co., July 29, 1899, *A. A. Heller;* swamp two miles south of Refton, in Eozoic, September 23, 1901, *A. A. Heller.*

MARYLAND: Hyattsville, September 12, 1899, *W. R. Maxon* no. 310; near Bush River, two miles north of station, September 11, 1902, *G. H. Shull* no. 369; Cumberland, *Howard Shriver.*

DISTRICT OF COLUMBIA: near Hamilton Hill, Washington, September 22, 1899, *W. R. Maxon* no. 339.

OHIO: without locality, *I. H. Lea.*

MISSOURI: Montevallo, October 17, 1915, *B. F. Bush* nos. 7897 and 7897A.; Campbell, September 6, 1910, *B. F. Bush* nos. 6199 and 6199A.

BB. Pinnules about 2 cm. long, triangular lanceolate, pinnatifid with oblong obtuse segments. . . . . *A. asplenioides* f. *subtripinnatum*.

[1] See Plate 123, figures 3–4 and 7–10.

[2] (N. E.), in the herbarium of the New England Botanical Club.

Athyrium asplenioides forma **subtripinnatum**, forma nov., frondibus maximis subtripinnatis, pinnulis deltoideo-lanceolatis ad 2 cm. longis, 8–10 mm. latis subacutis pinnatifidis, segmentis ordinis tertii oblongis obtusis ad apicem dentatis pinnulis parvulis formae typicae similibus.

A rare and unusually large form in which the segments of the third order, rather than the pinnules show the characteristic blunt oblong form (Plate 123, figs. 5 and 6).

Specimens in the Gray Herbarium:

Massachusetts: rich wet situations in half shade, Coon Hollow Brook, Milton, September 19, 1901, *F. G. Floyd* no. 89 b (N. E.); West Tisbury, July 26, 1916, *F. C. Seymour*.

West Virginia: Glady, Randolph Co., September 21, 1904, *J. M. Greenman* no. 32.

Virginia: altitude 3500 ft. near Luray, August 15, 1901, *E. S.* and *Mrs. Steele* no. 233; altitude 3600 ft. near Luray, August 27, 1901, *E. S.* and *Mrs. Steele* no. 48 (Type).

AA. Rhizome horizontal or somewhat oblique, completely concealed by the thick fleshy bases of the old fronds; scales of the stipes usually dark brown, their cells very narrow, and with thick usually dark walls; frond widest near the middle; indusia usually toothed or short ciliate, or rarely long ciliate, never glandular; spores yellow brown, smooth or sparingly papillate.

Athyrium angustum (Willd.) Presl.[1]

Aspidium angustum Willd. Sp. Pl. ed. 4, v. 277 (1810).

Asplenium Michauxii Spreng. Syst. iv. 88 (1827).

Asplenium elatius Link, Fil. sp. 94 (1841).

Athyrium angustum Presl, Rel. Haenk. i. 39 (1825) as to combination only, excluding description and specimens cited.

Asplenium Filix femina var. *Michauxii* Mett. Über einige Farngat. vi. Asplen. 199 (1859).[2]

Athyrium asplenioides var. *angustum* Moore, Index Fil. 179 (1860).

Athyrium Filix-femina var. *Michauxii* Burnham, Am. Fern Journ. vii. 54 (1917).

An exceedingly polymorphic species, varying but slightly in the characters of rootstock, scales, sori, indusia and spores, but very widely, in the form of the frond. On the basis of differences in the frond, the following varieties and forms may be recognized, though in every case they pass by imperceptible gradations into one another:

C. Fronds dimorphic, the fertile coriaceous, contracted, sori at maturity confluent and covering the lower side of the fertile pinnules. Sun-forms, found only in regions of hot summers.

[1] See Plate 123, figures 11–18.

[2] The frequently cited reference of this combination to Mettenius, Fil. Hort. Lips., 1856 is not correct. Mettenius there described the variety, but gave it no name.

D. Longest pinnae of the fertile frond 5–12 cm. long, pinnules 4–12 mm. long, simple, sori mainly asplenioid; pinnules of sterile fronds oblong obtuse, but slightly toothed or lobed.....*A. angustum* f. *typicum*.[1]

Willdenow described the pinnae as 1.5–2 inches long, the pinnules as 3 lines long. This is about the minimum size for a fruiting specimen. All sun-forms with simple pinnules may be considered as belonging to the typical form. These are the forms to which the varietal names *angustum* and *Michauxii* have commonly been given. As thus limited, the typical *A. angustum* ranges from Maine and southern Quebec to Massachusetts and Pennsylvania, being more common northwards. It does not occur in the region about the Gulf of St. Lawrence.

In the Gray Herbarium are the following specimens of this form:

Quebec: North Wakefield, July 4, 1911, *John Macoun*, Herb. Geol. Surv. Canada no. 83900; Rivière Ste. Marguerite, Lower Canada, August 14, 1879, *G. S. Pringle;* Lower Canada, August 3, 1880, *C. G. Pringle*.

Maine: Hartford, August 29, 1907, *J. C. Parlin* no. 2271; very dry open woods, No. Berwick, August 31, 1894, *J. C. Parlin*.

New Hampshire: roadside in the sun, Randolph, July 30, 1896, *E. F. Williams;* North Conway, August 14, 1877, herb. of *W. C. Lane;* Kensington and Seabrook, many specimens collected by *A. A. Eaton*, including his numbers 90, 145, and 182; Hampton Falls, August 3, 1899, *A. A. Eaton;* Mt. Vernon, August 1891, *M. L. Stevens*.

Vermont: without locality, 1855, herb. of *D. C. Eaton;* Dorset, 1915, *E. H. Terry* (N. E.).

Massachusetts: in sun, Salisbury, July 23, 1899, *A. A. Eaton;* in moist woods, Ipswich, *Wm. Oakes;* near Boston, *C. E.* and *W. Faxon;* Sharon, September, 1905, *S. F. Poole* no. 50.

New York: Gouverneur, August 1900, herb. of *E. C. Anthony*.

Pennsylvania: Bald Eagle Valley, Blair Co., 1860, *H. V. Bocking;* Friendsville, September 1, 1906, *M. H. Grant;* Pocono Plateau, 1904, *J. W. Harshberger*.

Ontario: Port Colborne, July 12, 1901, *John Macoun*, herb. Geol. Surv. Canada, no. 66416.

DD. Longest pinnae of fertile frond 1–2 dm. long, pinnules 12–25 mm. long, pinnatifid, sori several on each of the lower segments, often horse-shoe shaped; pinnules of sterile fronds oblong lanceolate, strongly toothed or pinnatifid, somewhat acute.

A. angustum var. *elatius*.

Athyrium angustum var. **elatius** (Link), new comb.

Asplenium elatius Link, Fil. Sp. 94 (1841).

Link describes the frond of his fern as sub-tripinnatifid, 3 feet long, pinnae 4–6 inches long, scarcely 1 line wide. The larger sub-forms

[1] See Plate 123, figures 11 and 12.

with a tendency to have compound pinnules may be placed here. This variety is not found quite so far north as the typical form, and is more abundant southward. In situations where both this and the typical forms occur, it is quite possible that this form may represent merely a more mature state of the plant than the typical form (Plate 123, figs. 14–16).

A. angustum var. *clatius* occurs from Maine to Minnesota, south to Rhode Island, New York and Missouri.

The following are the specimens of this variety in the Gray Herbarium:

Maine: North Berwick, July 27, 1894, *J. C. Parlin.*

New Hampshire: Kensington, August 3, 1899, *A. A. Eaton* no. 149; Nottingham, September 15, 1899, *A. A. Eaton* no. 303.

Vermont: open roadside, Repton, July 7, 1908, *E. F. Williams.*

Massachusetts: in moist woods, Ipswich, *Wm. Oakes;* roadside, in sun, Rockport, August 15, 1897, *E. F. Williams;* in shady woods, Hyde Park, August 24, 1902, *F. G. Floyd* no. 1119A; open woods, Rowley, August 9, 1899, *E. F. Williams.*

Rhode Island: dry open soil between Pilot Hill and Southeast Point, Block Island, August 20, 1913, *Fernald, Hunnewell* and *Long*, no. 8337.

Connecticut: trap soil, Bluff Mountain, No. Guilford, August 19, 1906, *G. H. Bartlett.*

New York: Lake Mahopac, August 1848, herb. *J. Carey;* Lawrence, September 23, 1914, *Orra P. Phelps* no. 14; moist woods, Clayville, August 5, 1899, *B. D. Gilbert;* Castle swamp, Oneida, August 12, 1906, *H. D. House* no. 2763, September 22, 1907, *Nellie Mirick;* Elmyra, September 22, 1907, *E. J. Winslow.*

Michigan: damp sandy ground, Rush Lake, Huron Co., August 22, 1907, *C. K. Dodge* no. 2; Lansing, July 7, 1887, *D. A. Pelton;* Wallace, Menominee Co., August 22, 1884, *J. H. Schuette.*

Minnesota: springy mud, St. Anthony (part of Minneapolis), July 20, 1888, *J. H. Schuette.*

Missouri: shaded banks, Dumas, *B. F. Bush* no. 5889.

CC. Fronds not dimorphic, coriaceous nor contracted, sori discrete at maturity. Forms of regions with cool summers, found also in dense shade in warmer regions.

E. Pinnules diminishing in size regularly toward the tip of the pinna, oblong or linear-lanceolate, 3–5 times as long as wide, regularly and coarsely toothed or pinnatifid, the basal anterior segment usually largest, the others regularly diminishing in size toward the tip of the pinnule.

F. Pinnules standing at a wide angle to the rachis of the pinna, often connected by a membraneous wing along the rachis of the pinna, teeth or segments of pinnules obtuse.

G. Pinnules lanceolate, subacute, strongly toothed or pinnatifid, the segments toothed, membraneous wing along the rachis obscure or wanting. . . . *A. angustum* var. *rubellum*.

ATHYRIUM ANGUSTUM var. **rubellum** (Gilbert), new comb.[1]

Athyrium filix-foemina rubellum Gilbert, List of N. A. Pterid. 35 (1901).

In the southern part of its range this variety appears to be merely the shade-form corresponding to the sun-forms discussed above, especially to the var. *elatius*, and its fronds are scarcely to be distinguished from the sterile fronds of that variety. The variety *rubellum*, however, ranges much farther to the north and east than either forma *typicum* or var. *elatius*, which appear never to occur in regions of cool summers.

The variety *rubellum* occurs throughout the range of the species, of which it appears to be the fundamental biological type, from which all the other varieties and forms have been derived. As here defined, it is not limited to forms with red stems, and hence it is unfortunate that we are obliged to adopt Gilbert's name. This is necessary, as authentic material of Gilbert's variety, collected by Gilbert himself, from his type locality, unquestionably belongs to the variety as here defined.

The following are the specimens of this variety in the Gray Herbarium:

NEWFOUNDLAND: barrens at the base of the serpentine tablelands, region of Bonne Bay; August 27, 1910, *Fernald* and *Wiegand* no. 2319; rocky border of hillside brook, Snook's Arm, Notre Dame Bay, August 19, 1911, *Fernald* and *Wiegand* no. 4284; Blow-me-down Mts., 1300 ft. altitude, August 4, 1908, *Eames* and *Godfrey* no. 5763; woods, Bay of Islands, August 9 and 10, 1901, *Howe* and *Lang* no. 1179; dry thicket, Bay St. George, August 5–7, 1901, *Howe* and *Lang* no. 989.

QUEBEC: low wet margin of Seal Cove River, Douglastown, Gaspé Co., August 22, 1904, *Collins, Fernald* and *Pease;* Bic, Rimouski Co., July 15, 1907, *Fernald* and *Collins* no. 817; Cap à l'Aigle, July 13, 1905, *John Macoun*, herb. Geol. Surv. Canada no. 69251; Little Metis, August 21, 1906, *James Fowler*.

PRINCE EDWARD ISLAND: roadsides thickets and borders of dry woods, August 29, 1912, *Fernald, Long* and *St. John* no. 6664.

NEW BRUNSWICK: in partial shade along a fence, Shediac Cape, August 2, 1914, *F. T. Hubbard*.

NOVA SCOTIA: Baxter's Harbor, July 10, 1900, *F. G. Floyd* no. 680; rich soil, edge of woods, Pictou, July 12–18, 1901, *Howe* and *Lang* no. 547, dry woods, Pictou, July 12–18, 1901, *Howe* and *Lang* no. 546; rich moist bank, Yarmouth, June 22–29, 1901, *Howe* and *Lang* no. 111; Kentville, July 11, 1900, *F. G. Floyd* no. 686.

MAINE: rich woods, Canton, August 1, 1908, *J. C. Parlin*.

NEW HAMPSHIRE: woods, Randolph, July 7, 1894, *E. F. Williams*. Alton Bay, *A. A. Eaton;* low woods, Jaffrey, July 21, 1897, *B. L.*

[1] See Plate 123, figure 13.

Robinson no. 249; roadside, Kingston, August 3, 1899, *A. A. Eaton* no. 150; East Kingston, June 24, 1900, *A. A. Eaton;* Hampton Falls, August 5, 1899, *A. A. Eaton.*

VERMONT: woods, Hancock, July 5, 1905, *E. F. Williams;* Manchester, July 21, 1898, *M. A. Day* no. 233.

MASSACHUSETTS: great swamp, Amesbury, June 24, 1899, *A. A. Eaton* no. 49; Boston, *C. E. Faxon;* id. *W. Faxon;* rich shady woods, West Roxbury, July 13, 1902, *F. G. Floyd* no. 1044; wet rich shady woods, Hyde Park, July 6, 1902; *F. G. Floyd* no. 1032A; shady woods, Milton, July 5, 1902, *F. G. Floyd* no. 1028; sandy bank, Concord, August 10, 1908, *E. F. Williams.*

CONNECTICUT: low woods, Southington, July 18, 1899, *C. H. Bissell.*

NEW YORK: Trout Lake, Hermon, September 4, 1900 (two collections), *B. D. Gilbert*; Clayville, July 25, 1899, *B. D. Gilbert* (type material of Gilbert's *A. filix-foemina rubellum*); bottom woods, Gouverneur, July 1900, *E. C. Anthony;* river bank, Pine Grove, July 8, 1894, *Grace Gilbert.*

PENNSYLVANIA: Friendsville, September 1, 1906, *M. H. Grant.*

ONTARIO: Ottawa, August 21, 1915, *Fr. Rolland* no. 135; Plevna, August 11, 1902, *J. Fowler.*

OHIO: Newark, May 6, 1905, *H. A. Gleason.*

MICHIGAN: moist woods, Hamlin Lake, Ludington, Mason Co., July 7, 1910, *Ralph W. Chaney* no. 109; among rocks in low places, Keweenaw Co., August, 1889, *O. A. F*[*arwell*].

ILLINOIS: Lincoln, July 4, 1899, herb. of *H. A. Gleason* no. 778.

WISCONSIN: Milwaukee, *I. A. Lapham.*

MINNESOTA: White Bear Lake, July 17, 1885, *J. H. Schuette.*

MISSOURI: Canton, May 30, 1906, *John Davis;* rich woods, Sibley, June 30, 1906, *B. F. Bush* no. 3999.

SOUTH DAKOTA: Sylvan Lake, Black Hills, altitude 6000–6500 ft., July 20, 1892, *P. A. Rydberg* no. 1195.

GG. Pinnae acute, pinnatifid pinnules oblong, obtuse, obscurely toothed, membraneous wing along the rachis of the pinna strongly developed.

A. angustum var. *laurentianum.*

ATHYRIUM ANGUSTUM var. **laurentianum**, var. nov., frondibus ac fertilibus ac sterilibus consimilibus membranosis, pinnis pinnatifidis acutis, pinnulis oblongis obscure serratis ala membranosa conjunctis, soris haud confluentibus ex pinnae costa remotis.

A northeastern variety with fronds corresponding to those of young plants of the variety *rubellum*, but the ample fruiting, and the strongly developed rootstock indicate clearly that the plants are mature. The range of this plant is indicated by the following list of the specimens in the Gray Herbarium:

LABRADOR: Wabeck Harbor, August 4, 1891, *Bowdoin College expedition to Labrador* no. 215.

NEWFOUNDLAND: boggy places on hill southwest of Tilt Cove,

Notre Dame Bay, August 22, 1911, *Fernald* and *Wiegand* no. 4285; rich shaded soil, Torbay, August 21–26, 1901, *Howe* and *Lang* no. 1433; woods, Virginia Water, August 5, 1894, *Robinson* and *Schrenk;* low damp clearings, Grand Falls, valley of Exploits River, July 20, 1911, *Fernald* and *Wiegand* no. 4283; Mc. Weils Cove, Bay of Islands, August 24, 1896, *A. C. Waghorne* no. 29; Birchy Cove, Bay of Islands, August 24, 1896, *A. C. Waghorne* no. 24; damp thickets, Bay St. George, August 5–7, 1901, *Howe* and *Lang* no. 1006a.

QUEBEC: eastern granite slopes, Table-Topped Mt., Gaspé Co., August 9 and 11, 1908, *Fernald* and *Collins* no. 275 (type); alpine bogs, Mt. Albert, Gaspé Co., July 21–23, 1906, *Fernald* and *Collins* no. 273.

MAINE: moist woods, Princeton, Washington Co., August 3, 1912, *S. N. F. Sanford* (N. E.).

EE. Adjacent pinnules varying irregularly from one another, irregularly lobed and toothed.

H. Pinnules 5–8 mm. broad, 10–18 mm. long, joined by a broad membraneous wing, lobes of the pinnules broad and overlapping.....*A. angustum* forma *confertum.*

ATHYRIUM ANGUSTUM forma **confertum**, forma nov., foliis ac fertilibus ac sterilibus consimilibus, pinnis pinnulisque inparibus, pinnis basin versus pinnatis, apicem versus pinnatifidis, pinnulis confertis ad 8 mm. latis, segmentis ordinis tertii imparibus confertis.

A form of *A. angustum* corresponding in the irregular cutting and overlapping of the broad pinnules to *A. Filix-femina* var. *latifolium* Babington, but with all the technical characters of *A. angustum.* Apparently this is a somewhat abnormal form without geographical significance as appears from the following list of specimens:

QUEBEC: boggy subalpine woods, altitude 1000 m., Table-topped Mt., Gaspé Co., August 13, 1906, *Fernald* and *Collins* no. 276 (type).

NEW HAMPSHIRE: Hampton Falls, August 5, 1899, *A. A. Eaton.*

MASSACHUSETTS: Brockton, September 8, 1907, *A. A. Eaton.*

The New England specimens are not so far removed from the ordinary var. *rubellum* as is the Gaspé specimen.

HH. Pinnules very irregular in size and shape, with many long acute teeth which project in various directions.

A. angustum forma *laciniatum.*

ATHYRIUM ANGUSTUM forma **laciniatum**, forma nov., frondibus ac sterilibus ac fertilibus consimilibus pinnulis erosis dentibus spinulosis incompositis instructis.

An abnormal form of fairly frequent occurrence, in which the frond looks as if it had been nibbled when young, some of the pinnules being wanting or greatly reduced, and all of them tending to show great irregularity of form. The teeth of the margins of the pinnules are unusually long and acute, and are inclined to stand out in a very irregular and disorderly fashion.

It corresponds exactly to the similarly named "variety" of *A. Filix-femina.* The following is a list of the specimens of this form in the Gray Herbarium:

MAINE: rocky bank of woodland stream, Buckfield, July 23, 1908, *J. C. Parlin* no. 2617.

VERMONT: in sun, edge of woods, Windham, August 30, 1902, *W. H. Blanchard* (type); Westmore, August 6, 1908, *E. J. Winslow* no. 21 (varying but slightly from the normal).

MASSACHUSETTS: low rich woods, West Roxbury, August 2, 1902, *F. G. Floyd* no. 1075.

NEW YORK: under tree in garden, Gouveneur, July 1900, *E. C. Anthony.*

FF. Pinnules oblique to the rachis of the pinna and prominently decurrent, though usually not connected by a membraneous wing, teeth of pinnules acute. . . *A. angustum* forma *elegans.*

ATHYRIUM ANGUSTUM forma **elegans** (Gilbert), new comb.

Athyrium filix-foemina elegans Gilbert, List of N. A. Pterid. 33 (1901).

A somewhat rare form with markedly oblique and decurrent widely spaced pinnules, the basal anterior pinnule usually much larger than the others. The following specimens in the Gray Herbarium are definitely of this form:

MAINE: Bar Harbor, herb. of *Francis H. Peabody.*

NEW HAMPSHIRE: Nottingham, July 17, 1900, *A. A. Eaton* no. 422.

RHODE ISLAND: Cranston, July 14, 1884, *J. F. Collins.*

NEW YORK: Trout Lake, Herman, September 4, 1900, herb. of *E. C. Anthony.*

ONTARIO: Owen Sound, *Mrs. Roy* (an exceedingly large specimen, nearly thrice pinnate, but showing the general character of this form).

It is notable that certain ferns of eastern Asia seem to be identical with certain of the American forms of *A. angustum*, having small dark scales similar in structure to those of the American plant, fronds moderately reduced downward, and sori with the characteristics of *A. angustum.* None of these specimens shows any part of the rhizome, so that it is impossible to say definitely whether *A. angustum* really reappears in eastern Asia like so many other east American plants, or whether it has there merely a representative species of very close affinity.

The specimens in question are: Northern China, 1910, *Wm. Purdom* no. 48, apparently *A. angustum* var. *typicum;* ad. fl. Schilka, Dahuria, *Turczaninow*, labelled "Asplenium Filix Feomina Bernh. var. tripinatum Rupr.," evidently some of the material referred by Ruprecht

himself to that variety with the comment "forma rigida" [1]; Mandshuria, ad. fl. Amur, 1855, *R. Maack;* the last two specimens appear to be var. *rubellum;* North China, 1886, *H. E. M. James* no. 192, close to var. *elatius*.

If these ferns should prove to be conspecific with the similar North American forms, an interesting nomenclatorial question would be raised concerning the status of Ruprecht's varietal name *tripinnatum*.

4. The Lady Ferns of Alaska, Western Canada and the Northwestern States.

In 1901, Gilbert recognized clearly the points of difference between the lady ferns of the northwestern states, British Columbia and Alaska and those of the eastern states.[2] So traditional, however, had become the view that our eastern ferns were true *Athyrium Filix-femina,* that Gilbert seems never to have noticed that, in the various points of difference which he noted, it is always the western, rather than the eastern plant which approaches most closely to the European type. Thus he says of the western fern, which he called *Athyrium cyclosorum* Ruprecht, "Indusium short, fringed early in the season with long, jointed cilia which disappear with age, generally hippocrepiform, sometimes only hamate," and a little lower on the page he mentions the "rotund sorus and jointed cilia of the indusium," descriptions which correspond perfectly with much of the European material. In a later publication [3] he mentions a color peculiarity (by no means general in western lady ferns) and then goes on to say, "the shape of the frond is very much like that of *Struthiopteris*. It tapers from the middle both ways, and the small lower pinnae come within four inches of the root. The farther down the stipe the pinnae are situated, the farther apart they stand. The pinnae themselves are quite different from those of *Asplenium filix-foemina*. Not only are they cut differently, but the enlargement of the anterior lower lobe, which is so distinct a feature of *A. f. f.* is entirely lacking here." It will be remembered that one of the diagnostic characters by which Willdenow distinguished his *Aspidium angustum* from the true *Filix-femina,* was

[1] Ruprecht, F. J., Dist. Crypt. Vasc. in Imp. Ros. 41 (1845).
[2] Gilbert, B. D., Working List of N. A. Pterid. 31 (1901).
[3] Id. Obs. on N. A. Pterid. Fern Bull. xiii. 76 (1905).

that the *former* species has "serraturis subbidentibus, infima superiore elongata."

A comparison of the specimens in the Gray Herbarium of *Athyrium Filix-femina* from western North America, with those from Europe shows that in all important respects there is complete agreement. Rhizome, scales, general form of frond, sori, indusia, sporangia and spores all agree. The indusia of the larger sori, measured in over twenty-five specimens give an average height of 0.55 mm., and an average length of 0.8 mm., precisely the dimensions obtained from European material.

The stalks of the sporangia proliferate as they commonly do in European material of *A. Filix-femina*. No case has been seen in west American material in which a branch of the sporangial stalk bears a glandular structure such as is common in the east American species, and is occasionally found in European material of *A. Filix-femina*.

The spores are yellowish, and average 38.9 × 24 μ in size.

Like the European *A. Filix-femina*, the northwestern plant is very variable. Some forms are common to both continents, while others appear to be peculiar to one or the other. The coarser European forms may be matched exactly with American material, while some of the finer cut forms, particularly var. *multidentatum* (Döll) Milde, and the form commonly known in Europe as var. *rhaeticum*,[1] appear to be wanting in this continent. A characteristically American variety is *A. Filix-femina* var. *sitchense* Ruprecht ex Moore,[2] a large and coarse

[1] This is the *Polypodium rhaeticum* of Linnaeus in part. As explained below on page 203 the Linnaean name is a nomen confusum, and should be rejected. The oldest tenable varietal name for this plant appears to be *Athyrium Filix-femina* var. *convexum* Newman, Hist. of Brit. Ferns, ed. 2, 245 (1844).

[2] Moore, Thomas, Index Fil. 183 (1860), where this combination appears in the synonymy, and is attributed to Ruprecht. Ruprecht's own publication in Dist. Crypt. Vasc. Imp. Ross., 41 (1845), was as follows:

65. Athyrium Filix foemina Roth, * * * * *

65β. Athyrium Filix foemina: tripinnatum * * *

65γ. Athyrium cyclosorum * Indusium brevius et sori plerumque rotundi. Petropawlowsk! (etiam pinnulis angustis) et Unalaschka!; Kadiak (Blaschcke!). Ut videtur etiam pr. Kola in Lappon. ross. crescit. (Hb. Baer!).

65δ. Athyrium sitchense * Frons interdum 4 pedalis; indusia brevissima fere cystopteridis; pinnae primariae secundariae pl. min. spatio pollicis dimidii disjunctae. Sitcha (Mertens!).

This publication of "γ *Athyrium cyclosorum*" and "δ *Athyrium sitchense*", has been cited by various authors, sometimes as the publication of species, and sometimes as that of varieties. Ruprecht, himself, in the preface to his paper (loc. cit., p. 6) speaks of them as "species secundi ordinis s. d. varietates characteres suos interdum constanter servantes."

Ruprecht's other subspecies, γ *Athyrium cyclosorum*, has been identified with the var. *sitchense* by many authors, and the name has been applied to some or all of our western lady ferns. As

variety sometimes 2 m. tall, pinnae 1–2 dm. long, remote, the lower ones with 5–10 cm. intervals; pinnules triangular-lanceolate, 1.5–3 cm. long, 0.5–1.5 cm. wide, remote, separated by about their own width, incised with numerous low, broad and blunt teeth, or in the largest fronds, pinnatifid, the segments of the third order oblong, obtuse, slightly 5–8 toothed, the largest 6 × 2.5 mm. in size.

This variety differs from *A. Filix-femina* var. *multidentatum* (Döll) Milde of Europe, chiefly in its relatively broad and short ultimate segments with almost suppressed marginal teeth, which are crowded towards the very obtuse apex of the segment. The immature form of this variety is the forma *Hillii*.[2] The pinnules at this stage are large (4–5 × 7–10 mm.), very blunt and rounded, crowded, and not at all pinnatifid, but with a somewhat crenate outline and numerous very small teeth borne chiefly at the summit of the pinnule. This type of foliage is retained until after fruiting commences, and until the fronds are 5–6 dm. tall. The transition to the mature form may sometimes

has already been pointed out, there is nothing about the sori of the American ferns of this species to distinguish them from many Scandinavian, German, and British specimens. Accordingly, Ruprecht's definition of γ *A. cyclosorum* becomes nearly meaningless, and his reference to Lapland in his statement of habitat indicates that he was including in his variety all those lady ferns which have unusually short and round sori. Some of his Alaskan material assigned to this variety is here considered as belonging to the var. *sitchense*, while the Asiatic (probably) and the European (certainly) is considered as typical *A. Filix-femina*. In this interpretation I am following Milde, who says (Fil. Eu. et At. p. 50, 1867.) "var. cyclosorum *Rupr.* ex insulis Kadjak et Unalaschka mihi nomine varietatis non digna videtur; specimina unalaschkensia paulum varietatis praecedentis [var. *sitchense*] nos commonent, and again, on p. 52 of the same work, "Athyrium cyclosorum *Rupr.* Beitr. III (1845) p. 41 nullo modo ab *A. Fil. fem.* differt."

Gilbert (List of N. A. Pterid. 31) says, "The only [specimens] in the U. S. which can be considered as something like type specimens are two in the Gray herbarium which were received from St. Petersburgh: one of them came from the Amur region, the other from Unalaska which was the type locality." The first mentioned specimen cannot be identified, as there are in the Gray Herbarium three specimens of lady ferns from the Amur region, all received by way of Petrograd, and all labelled "*Aspidium Filix foemina*." None of these shows any especial resemblance to the west American forms of this species. The Unalaska specimen is labelled, apparently in Ruprecht's own hand-writing, "*Aspidium Filix foemina* var. *aspidioides* Ruprecht," and has the printed data "Herb. Acad. Petrop.— Unalaschka.— Dr. Mertens." While this is probably some of the original material from which Ruprecht published his γ *A. cyclosorum*, it cannot be considered as type material, considering that it does not bear that name, nor any recognized synonym. It is a fairly well marked example of the var. *sitchense* as here defined. A specimen labelled in the same hand-writing, "*Athyrium Filix foemina* (L.) Roth. var.— Kamtschatka" is typical *A. Filix-femina*.

The synonymy of the var. *sitchense* is, therefore:

ATHYRIUM FILIX-FEMINA (L.) Roth. var. SITCHENSE Ruprecht ex Moore, Index Fil. 183 (1860).

δ *Athyrium sitchense* Rupr. Dist. Crypt. Vas. Ross., 41 (1845).

γ *Athyrium cyclosorum* Rupr. loc. cit. 41 (1845), in part.

[2] ATHYRIUM FILIX-FEMINA (L.) Roth. var. SITCHENSE Ruprecht ex Moore forma **Hillii** (Gilbert) comb. nov., *Athyrium cyclosorum* f. *Hillii* Gilbert, List of N. A. Pterid, 32 (1901).

be seen in a single frond, the lower pinnae showing the immature form, and the upper ones, the mature. As the immature type of foliage appears to be sub-permanent in some cases, it seems to be worthy of a formal name.

An extreme sun-form of the var. *sitchense* is the forma *strictum*,[1] which has narrowly lanceolate pinnules with revolute margins. It closely resembles the European var. *convexum* Newman, but may be distinguished from that variety by the lower pinnae, which in the European form are modified like the upper ones, whereas in the form now under consideration they are but slightly contracted, and resemble the basal pinnae of the typical var. *sitchense*.

Athyrium Filix-femina var. *sitchense* occurs from the Aleutian Islands to California,[2] chiefly near the coast, also at low altitudes in the Selkirk Mountains of British Columbia, and in northern Idaho.

American specimens of typical *Athyrium Filix-femina* in the Gray Herbarium:

IDAHO: near Lakeview, Kootenai Co., August 1–10, 1892, *A. A. Heller;* in damp forest at Mullan, Coeur d'Alene Mts., altitude 3000 ft., August 7, 1895, *J. B. Leiberg* no. 1493.

OREGON: Calapooga, Douglass Co., 800 ft. altitude, July 26, 1899, *M. A. Barber*, no. 125.

WASHINGTON: Stevens Pass, Cascade Mts. August 17, 1893, *Sandberg* and *Leiberg*, no. 771; deep canyon near springs, Blue Mts., Columbia Co., August 7, 1897, *R. M. Horner* no. B. 598; Tacoma, Sept. 17, 1898, *J. B. Flett;* Clark Springs, Spokane, June 26, 1902, *F. O. Kreager*, no. 34; without locality, *G. R. Vasey*, no. 45.

BRITISH COLUMBIA: Selkirk region: Upper Spillimacheen, altitude 6500 ft., August 3, 1904, *C. H. Shaw* no. 438; Spillimacheen valley, altitude 6000 ft., July 30, 1904, *L. R. Heacock*, in Shaw's Selkirk Flora, no. 421; near mouth of Downie Creek, altitude 1900 ft., August 9, 1905, *C. H. Shaw* no. 1127; Rogers Pass, altitude 4400 ft., August 9, 1904, *E. R. Heacock*, in Shaw's Selkirk Flora, no. 444; Goldstream, altitude 2200 ft., August 3, 1905, *C. H. Shaw* no. 1069.

Coast region: New Westminster, June 1899, *A. J. Hill;* on rocks in shady places, Pt. Renfrew, Vancouver Island, June–July 1901, *Rosendahl* and *Brand*, no. 106.

Specimens of *Athyrium Filix-femina* var. *sitchense* in the Gray Herbarium:

IDAHO: along creeks near Rathdrum, Kootenay Co., July 25, 1892, *McDougal* and *Heller*, no. 723.

[1] ATHYRIUM FILIX-FEMINA (L.) Roth var. SITCHENSE Ruprecht ex Moore forma **strictum** (Gilbert), comb. nov., *Athyrium cyclosorum strictum* Gilbert, loc. cit., 32 (1901).

[2] I have seen a single specimen of this variety from California. It is in the collection of Mr. R. A. Ware of Boston, and was collected by R. J. Smith near Sur River, Monterey Co. It was distributed as *Dryopteris spinulosa dilatata*.

OREGON: without locality, *Elihu Hall* no. 682 (f. *Hillii*).

WASHINGTON: Columbia River, 1841, *Hinds;* without locality, *G. R. Vasey* no. 47 (f. *strictum*), and no. 46; Ewell's yard, Quiniault, June 25, 1902, *H. S. Conard* no. 154; Cheney, *Mrs. Susan Tucker.*

BRITISH COLUMBIA: Selkirk region: Revelstoke, altitude 1600 ft. July 22, 1890, *John Macoun* (f. *strictum*), and July 3, 1905, *C. H. Shaw* no. 793; Glacier, altitude 3900 ft., August 8, 1909, *Butters* and *Holway* no. 475.

Coast region: New Westminster, 1899, *A. J. Hill,* an extensive series of specimens illustrating different stages in the development of this fern, and including type material of Gilbert's two forms.

ALASKA: "Unalaschka, Dr. Mertens," from Herb. Acad. Petrop., labelled in Ruprecht's writing, "Athyrium Filix foemina var. aspidioides Ruprecht"; White Pass, July 23, 1914, *Alice Eastwood* no. 874; Skagway, July 20, 1914, Alice Eastwood no. 796.

4. THE LADY FERN OF CALIFORNIA,[1] THE BASIN REGION, AND THE SOUTHERN ROCKY MOUNTAINS.

The lady fern of this region has been treated by all American authors as the true *Athyrium Filix-femina.* It is, however, found to differ from the typical form of that species in several minor respects, and in one important character. It should, therefore, be considered as a well marked geographical variety:

ATHYRIUM FILIX-FEMINA (L.) Roth. var. **californicum** var. nov. differt a forma typica paleis atris, indusiis interdum dentatis vel brevissime ciliatis, sporis majoribus reticulatis nigrescentibus.

The scales of this variety are usually considerably darker than in typical *A. Filix-femina,* but as in the case of similar dark scales found occasionally in European specimens, they have the same structure as the ordinary pale scales of *A. Filix-femina,* and not the fibrous structure characteristic of the dark scales of *A. angustum.* Short asplenioid sori are more frequent than in typical *A. Filix-femina,* and the indusia are seldom long ciliate, but rather short ciliate or merely toothed. In this respect they resemble those of *A. angustum,* but their dimensions are rather those of typical *A. Filix-femina.* They measure, on the average, 0.5 mm. high, and 0.8 mm. long. As in all American forms of *A. Filix-temina,* the sporangia are entirely without stalked glands. The most important peculiarity of this variety is the character of the spores, which are unusually large, averaging 43 × 27.5 μ,

and which have a distinct nigrescent, wrinkled and reticulate exospore similar to that found in *A. alpestre* and in *A. asplenioides.*

In its underground parts, and in the form of the frond, this variety is in no way peculiar. The frond is rather variable but generally agrees closely with ordinary European forms. It is usually markedly puberulent on the rachis and the back of the pinnae.

It ranges from California eastward to southern Idaho, Colorado and New Mexico. It also extends southward into Mexico, at least as far as the state of Chihuahua.

All specimens of *A. Filix-femina* in the Gray Herbarium within this range belong to this variety except that in Idaho and Wyoming some specimens occur which are intermediate between this variety and typical *A. Filix-femina.* These transitional forms have intermediate types of spores, or spores which are variable in type even on the same frond.

The following list contains a portion of the material of this variety in the Gray Herbarium:

COLORADO: Tabeguache Basin, 8000 ft., August 20, 1913, *Edwin Payson* no. 195; Fish Creek Falls, Routt Co., July 21, 1903, *Leslie N. Goodding* no. 125.

IDAHO: Trinity, Elmore Co., August 23, 1910, *J. F. Macbride* no. 635, distributed as *Cystopteris languida* A. Nels. n. sp.

UTAH: City Creek Canyon, August 9, 1884, *F. E. Leonard,* ex herb. Oberlin College, no. 201.

NEW MEXICO: Mogollon Mts., 7500 ft., Socorro Co., July 23, 1903, *O. B. Metcalfe* no. 298.

NEVADA: Little Valley, Washoe Co., 2000–2155 M., August 14, 1902, *C. F. Baker* no. 1466; Snow Valley, Ormsby Co., August 8, 1902, *C. F. Baker* no. 1444.

CALIFORNIA: Dollar Lake Canyon, San Gorgonio Mts., altitude 9000–9500 ft., July 12, 1908, *Abrams* and *McGregor,* no. 768, Mt. Eddy, Siskiyou Co., August 26, 1915, *A. A. Heller* no. 12234; Mt. Rose, near Webber Lake, August 15, 1874, *J. G. Lemmon;* outlet of Lake Chequita, Madera Co., August 16, 1895, *J. W. Congdon* no. 79 (TYPE).

Specimen: intermediate between *A. Filix-femina* and *A. Filix-femina* var. *californicum:*

WYOMING: Piney Creek, Bighorn Mts., August 28, 1900, *J. B. Jack.*

5. Athyrium alpestre and its American Variety.

The typical form of *Athyrium alpestre* (Hoppe) Rylands ex Moore[1] is an arctic-alpine plant of Europe, ranging from Iceland to Asia Minor. In habit and foliage it greatly resembles *A. Filix-femina*, from which it differs in its spores, which are nigrescent and reticulate, and in its sori, which are smaller than those of *A. Filix-femina*, almost perfectly round, and seemingly without any indusium. Careful dissection shows, however, that the receptacle of the sorus is slightly elongated along the vein, and under a compound microscope it is almost always possible to find a vestigial indusium in the same position that the indusium holds in forms of *A. Filix-femina* with round sori. This indusium is about 0.3 mm. high, and may extend along the vein for as much as 0.25 mm., but often consists merely of two or three hairs joined together side by side at the base. Its cilia are always swollen and glandular at the tip.

The peculiarly reduced condition of the sorus and indusium in this species has often lead to its being placed in genera far removed from the group now under consideration. Its structural general resemblance to *A. Filix-femina* is, however, very great, and the latter species occasionally has semi-abortive sori with indusia almost as reduced as those of *A. alpestre.*

A common arctic-alpine plant of North America has been traditionally identified with this species, but it differs in having the ultimate segments of the frond conspicuously narrower, and more widely separated from one another, and the sori even smaller than in the type (0.5–0.7 mm. in diameter as against 0.75–1.0 mm. in the typical form), sub-marginal and protected by a reflexed tooth of the pinnule. Care-

[1] Athyrium alpestre (Hoppe) Rylands ex Moore.

Aspidium alpestre Hoppe, Neue Taschenbuch 216 (1805).

Phegopteris alpestris Mett. Fil. Hort. Lips. 83 (1856).

Athyrium alpestre Rylands according to Moore, Ferns of Gr. Br. and Ir. Nat. Print. Fol. ed. Pl. 7 (1857).

Polypodium rhaeticum L. Sp. Pl. ii. 1091 (1753), in part.

Polypodium Rhaeticum L. was made up of a mixture of this plant and certain forms of *A. Filix-femina* which resemble it in the form of the frond. The latter alone are represented in the Linnaean herbarium under this name, while to the former belongs probably the name-bringing synonym, Bauhin's *Filix rhaetica tenuissime dentata.* With sundry variations the Linnaean name has been employed extensively for both of these ferns. This seems to be a clear case of a nomen confusum, which should be rejected under the international rules. For a further discussion of this question, see P. Ascherson, Osterreicher Bot. Zeit. 46: 44. 1896.

ful search has failed to disclose any vestige of indusium in the American material.

As certain intermediate forms occur, it is the opinion of the author that this plant should be considered a distinct geographical variety rather than a species.

ATHYRIUM ALPESTRE (Hoppe) Rylands ex Moore var. **americanum**, var. nov., omnibus frondium segmentis iisdem formae typicae angustioribus, inter se plus distantibus ultimis linearibus, soris minutis (0.5–0.7 mm. latis) rotundis submarginalibus, soris singulis dente marginali pinnulae everto tectis, velo nullo.

This variety is found in subarctic and high alpine situations from Alaska and British Columbia to California and Colorado, also in Gaspé Co., Quebec.

The following specimens of *Athyrium alpestre* var. *americanum* are in the Gray Herbarium:

QUEBEC: forming extensive areas in the alluvium of alpine brooks, easterly and northerly slopes, Table-top Mt. Gaspé Co., August 9, 1906, *Fernald* and *Collins* no. 151a; (specimens 9 dm. tall; crevices of granite rock, altitude 750–1050 m., easterly and northerly slopes Table-top Mt. Gaspé Co., August 9, 1906, *Fernald* and *Collins* no. 151.

MONTANA: altitude 5500–6000 ft., Glacier Basin below Sperry Glacier, August 5, 1901, *F. K. Vreeland* no. 1058.

IDAHO: moist places, Packsaddle Peak, Kootenai Co., August 6, 1892, *Sandberg, McDougal* and *Heller*, no. 858.

WYOMING: in glacial drift, Teton Mts., July 26, 1901, *Merrill* and *Wilcox* no. 1032.

COLORADO: rocky slopes and rock crevices, summit of North Park Range, Larimer Co., August 10, 1903, *L. N. Goodding* no. 1841.

CALIFORNIA: near summit of Mt. Rose, 8600 ft. altitude, 1877, *J. G. Lemmon* no. 1160; 7500 ft. altitude, Mt. Shasta, August 17, 1881, *C. G. Pringle;* 7800 ft. altitude, Mt. Shasta, August 16, 1903, *E. B. Copeland* (distributed by *C. F. Baker*) no. 3917; Mt. Shasta, 1877, *Hooker* and *Gray;* Mt. Shasta, 1897, *W. M. Canby* no. 414.

WASHINGTON: loose rock, 6000 ft. altitude, Mt. Rainier, August, 1895, *C. V. Piper* no. 2111; Mt. Rainier, August 1890, *E. C. Smith.*

BRITISH COLUMBIA: mountains near Ainsworth, Kootanie Lake, altitude 6000 ft., July 10, 1890, *John Macoun;* altitude 5500 ft., Fish Creek Valley, August 1906, *Butters* and *Holway;* on dry rocks, near top of Mt. Cheops [near Glacier], altitude 8200 ft., July 12, 1904, *E. R. Heacock* in *Shaw's* Selkirk Flora no. 453; altitude 4400 ft., Rogers Pass, August 23, 1904, *E. R. Heacock* in *Shaw's* Selkirk Flora no. 554; Selkirk Range, August 24, 1885, *John Macoun;* Cascade Mts. 49° N. lat., 1859, *Dr. Lyall.*

ALASKA: mountains, interior of Unalaska, October 10, 1871, *M. W. Harrington.*

The following specimens approach close to the European form in the cutting of the frond, but have no indusia:

CALIFORNIA: near summit of Sierra Nevada, Nevada Co., 1873, *Miller;* ridge south of Donner Pass at 7500 ft., Nevada Co., August 17, 1903; *A. A. Heller* no. 7186; 11500 ft. altitude, Saw Tooth Peak, Tulare Co., August 17, 1904, *Culbertson.*

OREGON: Union Co., 1878, *W. C. Cusick.*

WASHINGTON: Wenatchie region, altitude 7000 ft., August 1883, *T. S. Brandegee* no. 1222.

From this study of the *Filix-femina* group of *Athyrium,* it appears that these ferns follow certain laws of distribution, which have been noted often in the case of Phanerogams. Thus we find that the common woodland species of eastern North America (*A. angustum*) either reappears in eastern Asia, or is represented there by a very closely related species.[1] This plant, like many others of eastern North America ranges northeastward into the region of the Gulf of St. Lawrence, and there appears, often in a peculiar form, the variety *laurentianum.*[2] A very distinct species (*A. asplenioides*) occurs in the southeastern United States, and like so many plants of that region, extends northward along the Atlantic as far as southeastern New England.

The common fern of cool temperate Europe (*A. Filix-femina*) extends well across Asia, occurs in Kamchatka, and reappears in Alaska and British Columbia in precisely the same form. There are, however, in each of the chief areas occupied by this species, certain well marked minor forms peculiar to the respective regions,— in Europe the various finely cut forms, especially that commonly known as the variety *rhaeticum,* in the Pacific coast region from Alaska to Oregon the variety *sitchense.* Like a great number of plants of the wet western coast, this latter variety reappears at low altitudes on the climatically similar west slope of the Selkirk Range.[3]

[1] The close relations between the flora of the region of deciduous forests of eastern North America and the corresponding region of eastern Asia, was long ago pointed out by Asa Gray, in his classic essay, "Observations upon the Relation of the Japanese Flora to that of North America and other Parts of the northern Temperate Zone." Mem. of the Am. Acad. of Arts and Sciences, vi. 377 (1859).

[2] Professor Fernald, in studying the flora of the region about the Gulf of St. Lawrence, has found that a great many of the plants of that region are similarly peculiar. He informs me that it is never safe to assume that a plant of Newfoundland or Gaspé is identical with an apparently similar species of the eastern United States, until a detailed study has been made of all its technical characters.

[3] Several years ago the author pointed out (The Vegetation of the Selkirk Mountains, Appendix A. to Howard Palmer's "Mountaineering and exploration in the Selkirks" 354, 1914)

The southern extension of *A. Filix-femina* into the western United States is marked by a peculiar technical variety, as seems often to be the case with northern plants which extend south into California and the southern Rocky Mountains.

The *Filix-femina* group of the genus *Athyrium* presents a typical case of boreal distribution. Apparently the center of this distribution is somewhere in Asia. Christ says of the genus *Athyrium* in China, "The variation of the genus *Athyrium* in southern China is only equalled by that of the same genus in Japan and the Indian Himalaya, other countries belonging to the same botanical region....It is a plastic mass which appears to be endlessly modified.[1]

On the other hand the number of species of this genus in North America is limited to those just described and the two diplazioid species *A. acrostichoides* and *A. angustifolium*.

Moreover, as has been pointed out already, the *Diplazia* of tropical America, presumably descendents from the genus *Athyrium*, though very numerous as to species, appear to belong almost wholly to a section of the genus which is probably descended from *Athyrium acrostichoides* (Sw.) Diels or some very similar species, while the Asiatic *Diplazia* form a mass of species of almost endlessly complicated relationships.

Athyria of the true *Filix-femina* group extend south into the tropical mountains in Mexico (*A. Martensi* and *A. Dombei* Desv.), and

the strong relationship of the boreal flora of the Selkirk Range with that of Scandinavia. Evidence is accumulating, that this relationship extends to parts of the flora which cannot be considered as arctic-alpine, but rather cool temperate and subalpine.

The lady fern is only one of numerous cases in which plants of cool temperate Europe occur, in precisely the same form, in the cool and moist evergreen forests of British Columbia and Alaska.

The occurrence of *Athyrium alpestre* in the mountains of western America,— in this case in a somewhat modified form,— is another instance of the relationship of European and north-west American floras, though in this case the plant is distinctly alpine in character. The further extension of its range to the Gaspé region is entirely in keeping with the known facts concerning the flora of that interesting region. See Fernald, M. L., The Soil Preferences of Certain Alpine and Subalpine Plants. RHODORA, ix. 149 (1907).

The Reappearance of the variety *sitchense* in the western part of the Selkirk Range, is also entirely normal. Piper, in his Flora of Washington, Contrib. from the U. S. National Herb. xi. 53 (1906) called attention to the large number of west coast plants, which do not occur in the interior of Washington, but which reappear in the more moist hill country of eastern Washington and northern Idaho. Evidence is accumulating that a much larger number of coastal forms occur farther north in the region around Revelstoke, the interior region, which, above all others, has the nearest approach to the coastal climate.

[1] La variation du genre *Athyrium* en Chine mérid. n'a d'égale que celle du même genre au Japon et l'Himalaya indien, pays du reste qui appartient à la même région botanique..... C'est une masse plastique qui semble se modifier sans cesse. Christ, H. Les collections de Fougères de la Chine au Museum d'histoire naturelle de Paris. Bull. Soc. Bot. de France lii. Mém. i. 50 (1905).

thence into the South American Andes, in India (*A. pectinatum* Pr.) and in Abyssinia (*A. Schimperi* Mong., apparently the closest relative of our *A. asplenioides*). With these exceptions they are entirely wanting from the tropical regions, and from the southern hemisphere.

II. BOTRYCHIUM VIRGINIANUM AND ITS AMERICAN VARIETIES.

In 1915 Fernald and St. John [1] called attention to the fact that *Botrychium virginianum* about the Gulf of St. Lawrence differs from the more southern typical plant in several respects. They identified this form with *Botrychium virginianum* var. *europaeum* Ångström, a rare fern of Scandinavia, Russia, and central Europe. A re-examination of all the North American and European material of this species in the Gray Herbarium indicates that the actual condition is somewhat more complex.

In this examination particular attention has been paid to the character of the sporangia and of the ultimate segments of the fertile frond which bear the sporangia.

Each of the varieties has, indeed, its own characteristic sterile frond, but the attempt to distinguish them on this ground is unsatisfactory in view of the slight and often scarcely describable differences between the fronds of the different varieties, and the very considerable individual variation within the same variety.

Typical *Botrychium virginianum* (L.) Sw. has a sterile frond of thin texture with the pinnules lanceolate, deeply pinnatifid or nearly pinnate, and the ultimate segments oblong or lanceolate and scarcely or not at all spatulate. The ultimate segments of the fertile shoot are narrow (0.25–0.5 mm.) and thick, and in dried specimens appear nearly opaque. The mature sporangia are dark in color, varying in different plants from a moderately dark yellow brown to almost black. As in all the species of *Botrychium*, they vary considerably in size, the largest measuring 0.5–0.8 mm. in length and somewhat less in width.[2]

[1] Fernald, M. L., and St. John, Harold, The Occurrence of *Botrychium virginianum* var. *europaeum* in America. Rhodora, xvii. 233 (1915).

[2] The measurements of sporangia given throughout this discussion of *Botrychium virginianum* and its varieties, are all taken from large fully developed sporangia. Smaller sporangia are always mingled with the large ones, and these vary in size in the respective species proportionally with the larger ones.

In dehiscence the valves of the sporangia open very widely and recurve so that the open sporangium is nearly flat with a depressed pit in the center at the point of attachment. When moist, the empty sporangia close again, and are then of a distinctly flattened or lenticular form (see fig. 6, A and B). The walls of the sporangia are nearly opaque as seen under a microscope, and the superficial layer of the wall is seen to consist of irregular cells with thick, sinuous walls (see fig. 6, C).

Typical *Botrychium virginianum* is a plant found usually in rich deciduous woods. It is most abundant in calcareous regions, and ranges from Prince Edward Island to Minnesota, and south to Florida and Texas,[1] reappearing in exactly the same form in eastern Asia.

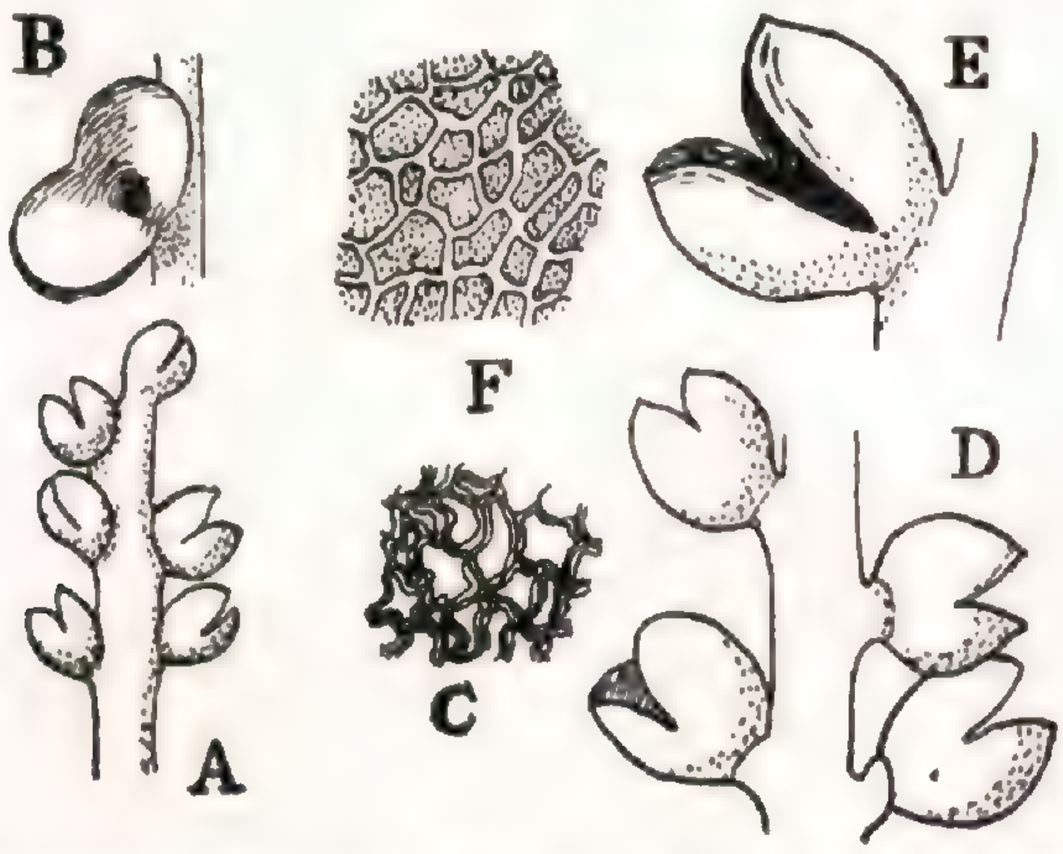

Fig. 6. A–C, *Botrychium virginianum* (L.) Sw. D–F, *B. virginianum* var. *laurentianum* Butters. A and D, group of sporangia, dehisced, but moist, dorsal view, × 5. B and E, dry, dehisced sporangium, ventral view, × 10. C and F, group of cells from the sporangial wall, × 75.

In the Gray Herbarium there are two specimens of it from the latter region, one collected by *Dr. August Henry* (no. 5799) in the province of Hupeh, China, the other by *K. Watanabe* in the province of Tosa, Japan.[2]

The plant found about the Gulf of St. Lawrence is a hitherto undescribed variety, BOTRYCHIUM VIRGINIANUM (L.) Sw. var. **lauren-**

[1] As has been recently pointed out by Ivar Tidestrom (*Botrychium virginianum* and its forms. Contrib.. U. S. Nat. Herb. xvi. 299. 1913.) *Botrychium gracile* Pursh (Flora Am. Sept. 656. 1814), described originally from Virginia, is only a young stage of the typical *Botrychium virginianum*.

[2] In Japan occurs also the closely related *Botrychium strictum* Undw., Bull. Tor. Bot. Club, xxx. 52 (1903), of which there is in the Gray Herbarium a single specimen collected by Maximowicz in Yokahama in 1862. This is quite distinct from any North American form known to the author.

tianum, var. nov., fronde sterili crassiore, segmentis ordinum omnium latioribus rebus formae typicae iisdem, segmentis confertis imbricatis ultimis spathulatis, fronde fertili crassa conferte paniculata segmentis ultimis herbaceis complanatis 0.5–1.0 mm. latis, sporangiis flavis 1–1.8 mm. longis (exsiccatis) anguste apertis.

This variety is characterized by its thick and heavy sterile frond, less finely divided than in the typical form, and with the segments so crowded that they overlap one another. Though it is generally smaller than the typical *Botrychium virginianum*, it occasionally reaches large size, the largest specimen seen, having the sterile frond 18 cm. long and 28 cm. wide. The pinnules are shorter than in typical *Botrychium virginianum*, and tend to be ovate in form and the ultimate segments are strongly spatulate. The fertile spike is relatively short and stout, and in well developed specimens is very strongly paniculate. Its ultimate segments are flat, foliaceous, and often 1 mm. wide.

It is, however, in the sporangia that this form differs most greatly from *Botrychium virginianum*. Indeed these organs resemble rather those of *Botrychium Lunaria* than those of typical *Botrychium virginianum*. They are 1–1.8 mm. long when dried, and sometimes exceed 2 mm. when fresh. When ripe, they are of a dark straw color like those of *Botrychium Lunaria*. Before dehiscence the line of fracture shows as a distinct paler band. In dehiscence they open but slightly, and the valves never become recurved. When moistened, they close again, regaining their almost spherical form (see fig. 6, p. 208 D and E). Under the microscope the walls of the sporangia appear very translucent, and the cells of the outer layer are seen to be of regular quadrilateral or polygonal form with nearly straight thickened walls (see fig. 6, p. 208, F).

So different is this fern from typical *Botrychium virginianum*, that, were it not for the intermediate varieties discussed below, it would certainly take rank as a distinct species. It grows typically in open, grassy places, occasionally on exposed rocks or talus. It is almost confined to the calcareous districts in the vicinity of the Gulf of St. Lawrence, as is shown by the following list of the specimens in the Gray Herbarium.

LABRADOR: limestone and calcareous sandstone terraces, Blanc Sablon, Straits of Belle Isle, August 6, 1910, *Fernald* and *Wiegand* no. 2356.

NEWFOUNDLAND: grassy strand, Ingornachoix Bay, August 2, 1910, *Fernald* and *Wiegand* no. 2354; damp talus of limestone sea-cliffs, Point Riche, Ingornachoix Bay, August 4, 1910, *Fernald* and *Wiegand* no. 2355; talus slopes of the marble region between Mt. Musgrave and Humber Mouth, July 18, 1910, *Fernald* and *Wiegand* no. 2353.

QUEBEC: cold calcareous walls of the Grand Coupe, Percé, Gaspé Co., August 5, 1907, *Fernald* and *Collins* no. 795 (a very small and immature plant); alluvial woods, Nouvelle, Bonaventure Co., July 19 and 20, 1908, *Collins* and *Fernald;* Grand Cascapedia River, Bonaventure Co., July 12–15, 1905, *Williams, Collins* and *Fernald* no. 1; meadows and swamps in the slaty region south of Bic, Rimouski Co., July 25, 1907, *Fernald* and *Collins* no. 794 (type); Rivière du Loup, July 24, 1908, *A. A. Eaton* no. 217; Little Metis, July 18, 1906, *James Fowler;* Georgeville, July 5, 1905, *J. R. Churchill.*

MAINE: rich upland meadows, Cutler, Washington Co., July 3, 1902, *Kennedy, Williams, Collins* and *Fernald;* larch and arbor-vitae swamps, Houlton, Aroostook Co., July 13, 1916, *Fernald* and *Long* no. 12302.

MICHIGAN: Isle Royale, Lake Superior, July 3, 1909, *W. S. Cooper* no. 23 (a large but very immature specimen, which appears to be of this variety, but cannot be identified with entire certainty).[1]

South of the region occupied by *Botrychium virginianum* var. *laurentianum*, there is a second variety somewhat intermediate between this fern and typical *Botrychium virginianum.* The sterile frond has the somewhat ovate pinnules and the spatulate ultimate segments of the var. *laurentianum*, though without the close imbrication of the segments which is characteristic of that variety. The ultimate segments of the fertile frond are narrow (0.25–0.5 mm. wide) as in typical *Botrychium virginianum*, but are thin and flat and more translucent than in that plant. The sporangia resemble those of var. *laurentianum* except in their smaller size (0.5–0.8 mm. long when dried) and slightly wider dehiscence. This also is an undescribed variety,

BOTRYCHIUM VIRGINIANUM (L.) Sw. var. **intermedium**, var. nov.,

[1] This list includes all the material of the *Botrychium virginianum* group from the region of the Gulf of St. Lawrence with three exceptions, viz.: 1. Typical *Botrychium virginianum* occurs on Prince Edward Island as indicated by the following specimens: swampy *Larix* and *Thuja* woods, Tiginish, August 6, 1912, *Fernald, Long* and *St. John* no. 6679; springy larch swamp, Bloomfield, August 7, 1912, *Fernald, Long* and *St. John* no. 6680; larch swamp, Dundee, August 26, 1912, *Fernald, Long* and *St. John* no. 6681. 2. The following variety occurs on Cape Breton Island, as noted on p. 211. 3. Three plants collected by Mr. Harold St. John in September 1915, at Betchouam, Seignoiry of Mingan, on the south shore of the Labrador peninsula (Geological survey of Canada, no. 90028) appear to belong to an undescribed variety of *Botrychium virginianum.* They were, however, collected so late in the season, and in such an over-mature condition that it seems best to postpone a description of this form until better material can be obtained. As Mr. St. John hopes to visit the same region again, in the near future, I have hopes that additional material of this form may soon be available.

segmentis frondis sterilis ultimis spathulatis, penultimis ovatis haud confertis, segmentis frondis fertilis ultimis angustis complanatis, sporangiis flavis ad 0.8 mm. longis.

This variety occurs in Nova Scotia, New England and northern New York, and also in Illinois and Missouri. The following specimens, in the Gray Herbarium belong to this variety:

NOVA SCOTIA: hardwood forest, Indian Brook, valley of the Barrassis River, Cape Breton Island, July–August 1915, *G. E. Nichols* no. 1562.

MAINE: open springy meadows, Brownville, July 18, 1905, *Knight* and *Parlin* no. 1913.

VERMONT: Arlington, July 5, 1913, *N. H. Blanchard* no. 57.

MASSACHUSETTS: dry rocky upland woods, North Adams, June 25, 1913, *Fernald* and *Long* no. 8374 (N. E.[1]).

CONNECTICUT: rich woods, North Guilford, June 22, 1906, *G. H. Bartlett.*

NEW YORK: moist woods, Canton, June 25, 1914, *Orra P. Phelps* no. 47 (TYPE); Pierrepont, July 10, 1914, *O. P. Phelps* no. 48; moist woods, Norfolk, July 7, 1914, *O. P. Phelps* no. 50 (all in St. Lawrence Co.).

ILLINOIS: rich woods, C. H. and D. bridge, Macon Co., May 21, 1915, *I. W. Clokey,* no. 2387.

MISSOURI: rich woods, Monteer, May 26, 1907, *B. F. Bush* no. 4724; Whiteside, June 13, 1910, *John Davis.*

BOTRYCHIUM VIRGINIANUM var. EUROPAEUM Ångström is also somewhat intermediate in character but quite unlike the variety just discussed. The fertile frond is less finely dissected than in typical *Botrychium virginianum*, and the ultimate segments are usually more obtuse than in that plant, but they show little of the spatulate form seen in var. *laurentianum* or var. *intermedium.* The pinnules are lanceolate, and tend to be strongly decurrent so that the pinnae are usually merely pinnatifid. The sporangia resemble those of *Botrychium virginianum* rather than those of either of the varieties just described. They are somewhat larger than in the typical form (0.7–1.2 mm. long), and slightly lighter colored, but with a distinct dark stripe along the edge of the valves. Their dehiscence is wider than that of either of the varieties just described, and nearly as wide as that of *Botrychium virginianum*, but usually without the strong recurving of the valves seen in that form. The microscopic structure of the sporangium wall is somewhat intermediate between that of true *Botrychium virginianum* and that seen in the two varieties just discussed. Some irregular cells with sinuous walls are always present in the outer layer of the wall, but much of this layer is made up of nearly regular quadrilateral cells.

Like the majority of lowland plants common to temperate Europe

[1] Herbarium of the New England Botanical Club.

and North America, this variety is essentially a plant of the evergreen coniferous forests. In America it is a plant of the Canadian zone, and is confined largely to calcareous regions. In Europe it appears to be very rare. There are specimens in the Gray Herbarium from the Baltic regions of Sweden (Ångermannland) and Russia (Petrograd and Novgorod). It is also reported from Bohemia. The European plant has conspicuously large sporangia, so also has the British Columbian plant, which is an exact match for the Russian plant in all respects. In the eastern United States the size of the sporangia is usually less and there is a complete intergradation between this variety and typical *Botrychium virginianum*.

The following American specimens of this variety are in the Gray Herbarium:

QUEBEC: Montmorenci Falls, July 1, 1905, *John Macoun*.

NEW BRUNSWICK: St. Francis parish, July 29, 1900, *E. F. Williams*.

NEW HAMPSHIRE: Randolph, July 15, 1894, *E. F. Williams;* ib., July 18, 1894, *E. F. Williams* (N. E.).[1]

VERMONT: rich woods, Westmore, July 24, 1903, *R. A. Ware* (N. E.).

NEW YORK: Pierrepont, St. Lawrence Co., July 10, 1914, *Orra P. Phelps* no. 48.

ONTARIO: sandy woods, Nepigon House, Lake Nepigon, July 15, 1884, *John Macoun;* clay soil, Ouaman River, Hunder Bay district, *H. E. Pulling*.

MONTANA: Swan Lake near Flathead Lake, August 25, 1908, *Mrs. John Clemens* (in part).

BRITISH COLUMBIA: rich soil, avalanche path, Emerald Lake, altitude 4400 ft. (Rocky Mts.), July 1, 1904, *C. H. Shaw* no. 83; flood plain of Columbia River, Beavermouth, altitude 2400 ft., August 18, 1905, *C. H. Shaw* no. 1157; woods, Carbonate (upper Columbia valley), altitude 3000 ft., July 8, 1904, *T. B. Snyder* in *Shaw's Selkirk Flora* no. 207; forest near mouth of Downie Creek (west slope of Selkirk Range), August 7, 1905, *C. H. Shaw* no. 1106; New Westminster, September 15, 1899, *A. J. Hill*.

Besides the varieties of *Botrychium virginianum* in eastern and northern North America yet another one occurs in the far western states. It appears to be a direct development from the var. *europaeum*, and occasionally grows with that form. The sterile frond is exactly like that of the var. *europaeum*, but the sporangia are peculiar. In the species and its other varieties the sporangia are narrow at the base, and when one of them is sufficiently wide open so that the inside is visible, the narrow base appears as a funnel-like hole leading down from near the middle of the expanded upper portion. In this western variety, on the other hand, the base of the sporangia is very nearly its widest part. This broad base is herbaceous, and appears like a

[1] This is a somewhat peculiar specimen, see below, p. 213.

lobe of the ultimate segment of the fertile frond. When the sporangium has opened, an inside view has something the appearance of the inside of a straw hat, the shallow crown of which is formed by the wide lower part of the sporangium. The herbaceous base then appears as a dark spot in the middle of the open sporangium, corresponding in its position to a lining in the top of the crown of the hat. The sporangia in this variety are as small as in typical *Botrychium virginianum*, rarely over 0.7 mm. long and their walls consist of irregular cells with flexuous walls, as in the typical form.

A single specimen of *Botrychium virginianum* var. *europaeum* from the eastern states, that from Randolph, N. H., previously noted as peculiar, shows a somewhat similar broadening of the base of the sporangium, though to a smaller degree. In the size and the microscopical structure of the sporangia it corresponds with the var. *europaeum*. Otherwise the specimens displaying the peculiarity here discussed are all western, and I am calling the variety

BOTRYCHIUM VIRGINIANUM (L.) Sw. var. **occidentale**, var. nov., varietati *europaeo* similis sed sporangiis 0.5–0.7 mm. longis, basin versus latioribus herbaceis late apertis.

The following specimens are in the Gray Herbarium:

MONTANA: Swan Lake, near Flat Head Lake, August 25, 1908, *Mrs. Joseph Clemens* (in part).

IDAHO: deep woods near the south end of Lake Pend d'Oreille, July 28, 1892, *Sandberg, McDougal* and *Heller* no. 762 (type).

OREGON: Hood River, April 1882, *Mrs. P. G. Barrett.*

CALIFORNIA: without locality, 1873, "*Miller.*"

In Mexico there are two *Botrychia* belonging to the group now under discussion. One of these occurs also in Central America and the West Indies, and possibly also in the Andes. The other, apparently confined to Mexico, has usually been considered as *Botrychium virginianum*, but it differs so much from the typical form of that species in the form and cutting of the sterile frond, that it should be distinguished as a variety, BOTRYCHIUM VIRGINIANUM (L.) Sw. var. **meridionale**, var. nov., fronde sterili haud ternata, pinnis basalibus eas secundas parum superantibus, pinnulis ovatis ad basin cordatis vel truncatis vel brevissime cuneatis pinnatifidis, segmentis ordinis tertii approximatis obovatis seu spathulatis obtusissimis crenulato-serratis, fronde fertili atque sporangiis iisdem *Botrychii virginiani* typici similibus.

This plant is evidently closely allied to true *Botrychium virginianum* with which it agrees entirely in the character of the fertile spike and the details of the sporangia except that the valves of the latter are usually somewhat less recurved in dehiscence. It differs, however, in both the form and the cutting of the sterile frond. The basal pinnae are only slightly longer and wider than the second pair, so that the frond is distinctly pinnate rather than ternate. The pinnules are wider and shorter than in the typical form and are truncate or

cordate, rarely very slightly cuneate at the base. They are cut into obovate or spatulate very blunt segments, which lie so close to one another that, at a little distance, the pinnule appears as if it were nearly undivided.

In the Gray Herbarium are two excellent specimens of this plant: Chiapas, *Dr. Ghiesbreght*, filices austro-mexicanae no. 252 (type); in the San Migueleto Mountains, valley of San Luis Potosi, *J. G. Schaffner*, flora mexicana no. 943.

BOTRYCHIUM CICUTARIUM (Savigny) Sw. Syn. 171 (1806). (*Osmunda cicutaria* Savigny in Lam. Encycl. iv. 650, 1797). Ivar Tidestrom has recently pointed out [1] the identity of the Mexican fern *Botrychium brachystachys* Kunze, and the West Indian fern *Botrychium dichronum* Undw. with the old species *Botrychium cicutarium*. As has been pointed out several times, this species has a very short fertile spike, but little exceeding the length of the sterile frond. It is also peculiar in having often a second sterile leaf present at the time of fruiting. It seems to be generally assumed that this second leaf is the remaining sterile part of the fruiting leaf of the previous year, but in a specimen in the Gray Herbarium which shows this second leaf, there is no indication that it ever bore a fertile spike. In this species the sterile frond has greatly enlarged basal pinnae as in ordinary *Botrychium virginianum*, the pinnules are lanceolate, acute, markedly decurrent at the base, and conspicuously cut about two thirds of the distance to the midrib. The ultimate segments of the fertile frond are flat and moderately broad. The sporangia are small (0.5–0.7 mm. long), and dark brown. Their dehiscence is narrow, with a slight recurving of the tips of the valves.

It is not quite clear to the author whether this plant should be considered as a species or as a variety of *Botrychium virginianum*. The differences between this form and typical *Botrychium virginianum* are no greater than the differences between some of the North American varieties of that species. On the other hand there is at present no evidence of any intergradation such as is found between the various North American varieties. It was long since given a varietal name, *Botrychium virginicum β mexicanum* Greville and Hooker, Bot. Misc. iii. 223 (1833).

Specimens in the Gray Herbarium:

SANTO DOMINGO: in woods near Constanze, 4000 ft. altitude, February 1910, *von Tuerckheim* no. 2963; in woods, Tal Mingo, Province of Barahona, 4400 ft. altitude, April 1912, *Padre Miguel Fuertes* no. 1540.

MEXICO: Jalapa, state of Vera Cruz, 4000–4500 ft. altitude, 1894, *C. L. Smith* no. 2141.

GUATEMALA: Volcan de Agua, *O. Salvin*.

This plant is also reported from Jamaica and Panama, and either this or a closely related form from Ecuador.

[1] Contrib. U. S. Nat. Herb. xvi. 307 (1913).

Key to the American species and varieties of the BOTRYCHIUM VIRGINIANUM group.

A. Ripe sporangia straw colored, opening but slightly in dehiscence, their walls composed of regular cells; pinnules of the sterile frond ovate to lance-ovate, their ultimate segments spatulate.
B. Sporangia 1–1.8 mm. long, segments of sterile frond imbricated.
B. virginianum var. *laurentianum*.
BB. Sporangia 0.5–0.8 mm. long, segments of sterile frond not imbricated.
B. virginianum var. *intermedium*.
AA. Ripe sporangia brown, opening rather widely in dehiscence, their walls composed, at least in part, of irregular cells with sinuous walls.
C. Fertile shoot much longer than the sterile frond, no additional sterile leaf present at the time of fruiting.
D. Sporangia with conspicuously broad herbaceous bases.
B. virginianum var. *occidentale*.
DD. Sporangia narrow at the base.
E. Sporangia 0.7–0.8 mm. long, dark brown, concolorous, their valves recurved in dehiscence.
F. Pinnules of sterile frond but slightly dissected, cordate or truncate at base, valves of sporangia moderately recurved.
B. virginianum var. *meridionale*.
FF. Pinnules of sterile frond much dissected, cuneate or decurrent at base, valves of sporangia strongly recurved.
B. virginianum.
EE. Sporangia 0.7–1.2 mm. long, their valves light brown with a darker margin, valves usually not recurved in dehiscence.
B. virginianum var. *europaeum*.
CC. Fertile shoot but little longer than the sterile frond, an additional sterile leaf present at time of fruiting.....*B. cicutaria*.

Again, as in the case of *Athyrium Filix-femina* and its allies an examination of the close technical characters of *Botrychium virginianum* shows that it is readily divided into natural varieties, and these are found to have a distribution entirely in harmony with what is known concerning the laws of the distribution of Phanerogams and indeed, very similar to the distribution of the *Filix-femina* group.

Thus we find *Botrychium virginianum* occurring in the deciduous forests of eastern North America, and again, in this case entirely unchanged, in eastern Asia,— both in China and in Japan. Again we find the European plant reappearing unchanged in the Pacific northwest of America, and in this case occurring eastward across the continent in the evergreen coniferous forests.

In Japan there is one local variation from the typical form of the species (*B. strictum*), and in eastern North America there are at least

two, and probably three such variants. As in the case of *Athyrium angustum*, the lands about the Gulf of St. Lawrence are a region of maximum departure from the ordinary type of the species.

As in the case of *Athyrium Filix-femina*, *Botrychium virginianum* var. *europaeum* undergoes a marked change in passing southward into the Californian region and there develops the peculiar variety, *Botrychium virginianum* var. *occidentale*.

Like the *Filix-femina* group, *Botrychium virginianum* and its allies have a typical boreal distribution, and all tropical forms of this group have evidently come from the north. Thus in Mexico we find *Botrychium virginianum* var. and *Botrychium cicutarium*. The latter species is also in the West Indies, and this or a closely allied species occurs for some distance south in the Andes. In Asia, *Botrychium lanuginosum*, considerably more aberrant than any of the forms yet mentioned, occurs in the Himalayas, and in southern China, and thence south to the hill country of southern India, Ceylon, and the Philippine Islands.

There is a single species of *Botrychium* in Africa, and that is said to be a close relative of the last mentioned species, and hence a member of the *Botrychium virginianum* group. This is *Botrychium chamaeconium*, and it occurs in the mountains of Cameroon. It is the only member of the group which is not either strictly boreal, or else in tropical mountains with easy access to the north.

In one respect the *Botrychium virginianum* group differs in its distribution from the *Filix-femina* group. They present their most complicated arrays of forms, not in Asia, but in eastern North America, and it seems probable that the latter region is the center of distribution of this group of plants.

Explanation of Plate 123.

Figs. 1–2. European specimens of *Athyrium Filix-femina* (L.) Roth: fig. 1, pinnule of var. *multidentatum* (Döll) Milde, × $2\frac{1}{2}$; fig. 2, pinnule of var. *fissidens* (Döll) Milde, × 5.

Figs. 3–10. *Athyrium asplenioides* (Michx.) Desv.: fig. 3, pinna of typical form, × $\frac{1}{2}$; fig. 4, pinnule of the same frond, × 5; fig. 5, mature pinnule of f. *subtripinnatum* Butters, × 2; fig. 6, base of younger pinnule of the same form, × 5; fig. 7, indusium of *A. asplenioides*, × $12\frac{1}{2}$; fig. 8, detail of the margin of a portion of the indusium, × 50; fig. 9, sporangium, × 50; fig. 10, spores, × 100.

Figs. 11–18. *Athyrium angustum* (Willd.) Presl.: figs. 11 and 12, pinnules of fertile and sterile fronds, respectively of the same plant of f. *typicum*, × 5; fig. 13, pinnule of var. *rubellum* (Gilbert) Butters, × 5; fig. 14 and 15, pinnules of the fertile and nearly sterile fronds respectively of var. *elatius* (Link) Butters, × 2; fig. 16, base of younger fertile pinnule of var. *elatius*, × 5; fig. 17, margin of indusium, showing the ordinary type found in *A. angustum*, × 50; fig. 18, spores, × 100.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,— XXV.

Clarence H. Knowlton.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Capparidaceae.						
Cleome serrulata Pursh	—			+		+
" spinosa L.				+		
Polanisia graveolens Raf.			+			—
" trachysperma T. & G.						—
Resedaceae.						
Reseda alba L.	+		—	+		+
" lutea L.	+			+	+	+
" Luteola L.				—	+	—
" odorata						—
Sarraceniaceae.						
Sarracenia purpurea L.	+	+	+	+	+	+
" " var. heterophylla (Eat.) Torr.	+		—	+		
Droseraceae.						
Drosera filiformis Raf.				+		
" linearis Goldie	+					
" longifolia L.	+	+	+	+	+	+
" rotundifolia L.	+	+	+	+	+	+
Podostemaceae.						
Podostemum ceratophyllum Michx.	+		—	+	+	+
Crassulaceae.						
Penthorum sedoides L.	+	+	+	+	+	+
Sedum acre L.	+	+	+	+	+	+
" anophyllum DC.	+					
" reflexum L.				+		

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
CRASSULACEAE.						
Sedum roseum (L.) Scop.	+		+			
" stoloniferum Gmel.	+					
" ternatum Michx.			+	+		+
" triphyllum (Haw.) S. F. Gray (S. purpureum Tausch)	+	+	+	+	+	+
Sempervivum tectorum L.		+		+		—
Tillaea aquatica L.	+			+		+

NOTES ON THE ABOVE LIST.— *Polanisia graveolens* is native and abundant on the shore of Lake Champlain, reported from Swanton south to Fair Haven. In Connecticut it has been reported at East Hartford, on gravelly and sandy shores of the Hockanum River (*C. A. Weatherby*), and on the Connecticut River at Hartford (*A. W. Driggs*). *P. trachysperma* is probably introduced (Conn. State Geol. & Nat. Hist Survey Bull. no. 14, 1910).

The species of *Reseda* are rare weeds of waste places. *R. odorata* is familiar in gardens, but very rarely spreads outside.

Sarracenia purpurea was reported on by Dr. B. L. Robinson in RHODORA, v. 190, 1903, but no mention was made of var. *heterophylla*. This is a striking plant in which the flowers and leaves are green throughout. Reported from Andover, Maine (*Francis H. Peabody*), and in Massachusetts from Essex Co. (*J. Robinson*), Scituate (*E. W. Cushman*) and Chestnut Hill (*E. F. Williams*).

Drosera filiformis is found from Plymouth to Wellfleet on the mainland of Cape Cod, also on Nantucket. There is a report of this plant in the Portland Catalogue of Maine Plants 1, 1868, but no specimen is known to exist.

D. linearis was discovered in large quantity by Prof. M. L. Fernald in muck holes of Crystal Bog, Aroostook Co., Maine, Aug. 16, 1900. It was found also by Dr. J. A. Cushman in the same county, in moist clayey soil between boulders of river-bank, Upper St. John River at Little Black River Rapids, Township 17, Range 1, Sept. 13, 1907. (Specimens in herb. Boston Soc. Nat. Hist.)

Sedum anophyllum occurs only at Bristol, Maine (RHODORA, XIV. 227, 1912). *S. reflexum* has been found only at Rockport, and Carlisle

or Concord, Massachusetts (RHODORA, xviii. 249–50, 1916). *S. roseum* is abundant everywhere on sea-ledges of the outer islands in eastern Maine, and occasional on the mainland and islands as far west as Monhegan. (RHODORA, xv. 140, 1913). It also grows on Mt. Horrid, Rochester, Vermont. *S. stoloniferum* occurs only at Cumberland, Maine (*E. B. Chamberlain*). *S. telephioides* reported by Mrs. N. F. Flynn from Colchester, Vermont. (Vt. Ag. Exp. Station, Bull. no 187, 209, 1915) where it is a roadside escape, does not quite match other material of that species and may be a variant of *S. triphyllum*.

Tillaea Vaillantii Willd., reported from Nantucket by Mrs. M. P. Robinson, Floyd, Bicknell and others, seems to be only a form of *T. aquatica* with long pedicels, not the *T. Vaillantii* of Europe according to Dr. Harold St. John.

HINGHAM, MASSACHUSETTS.

THE TARDY FLOWERING OF PLANTS IN EASTERN MASSACHUSETTS IN THE SPRING OF 1917.— In RHODORA, xii. 127–129 (1910), a list of plants which had been observed in flower in eastern Massachusetts prior to the end of April, 1910, was published. That season was a phenomenally advanced one and the list as published, although afterwards demonstrated to be incomplete, enumerated 119 species. The current spring, of 1917, has been so phenomenally backward as to excite comment even of the least observing people and at a conference of members of the New England Botanical Club held at the Club Herbarium on May 11th a canvas was made of the observations to date of the members present. The very meagre list which it was possible to prepare of plants which had been observed in flower to date, May 11th, is in such striking contrast to that of April, 1910, that it is thought that other members of the Club and readers of RHODORA will be interested to have it accessible. The following list, then, enumerates all the species of wild plants which are definitely known to have flowered in 1917 in eastern Massachusetts prior to May 12th.

Poa annua
Carex umbellata
" pensylvanica
Symplocarpus foetidus
Erythronium americanum
Salix discolor
" humilis
" rostrata
" tristis
" cordata

Salix sericea
Populus tremuloides
" grandidentata
Corylus americana
Corylus rostrata
Alnus incana
" rugosa
" vulgaris
Ulmus americana
Stellaria media
Cerastium vulgatum
" semidecandrum
Anemonella thalictroides
Hepatica americana ("triloba")
Anemone quinquefolia
Caltha palustris
Benzoin aestivale
Sanguinaria canadensis
Draba verna
Capsella Bursa-pastoris
Potentilla pumila
Acer rubrum
" saccharinum
Viola pedata, var. lineariloba
" fimbriatula
Epigaea repens
Arctostaphylos Uva-ursi
Lamium amplexicaule
Houstonia caerulea
Antennaria plantaginifolia
" neglecta
Petasites vulgaris
Taraxacum officinale
" erythrospermum

The above list, enumerating 44 species, although containing a few species, of *Salix* for instance, which did not happen to get observed in the early spring of 1910, and doubtless omitting a few plants, such as *Tussilago*, which had certainly flowered but which no one at the conference had observed in the spring of 1917, is sufficient evidence of the tardiness of the season and of the great range in the flowering season from year to year of the earlier flowering plants of New England.—M. L. F.

Vol. 19, no. 224, including pages 133 to 168, was issued 10 September, 1917.

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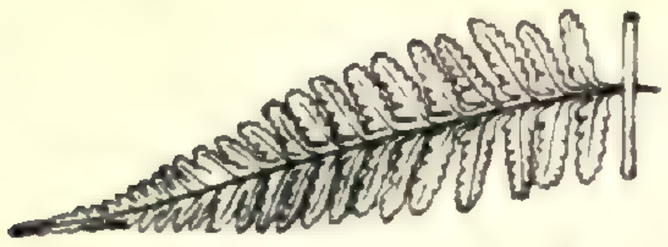
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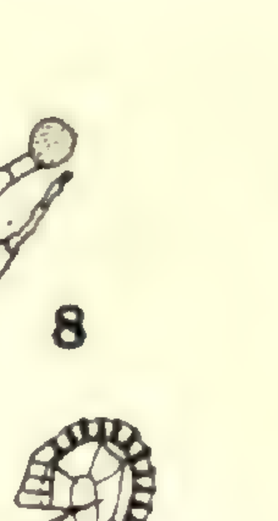
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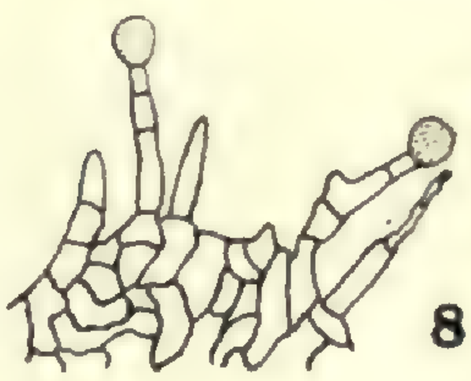
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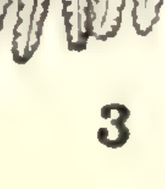
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ATHYRIUM FILIX-FEMINA AND ITS ALLIES.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

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A NEW ALPINE WILLOW FROM THE WHITE MOUNTAINS.

M. L. Fernald.

One of the areas in the White Mountains of New Hampshire unknown to most botanists is the wet southwest gully of King's Ravine. The dripping rocks of the gully and its high precipitous cliffs have proved forbidding to the path-builder, and only the most expert climbers have found their way into it. Among the latter, naturally, is the indefatigable explorer of Coös County, Professor Arthur Stanley Pease, who in July, 1909, discovered[1] in this gully of King's Ravine the arctic-alpine *Taraxacum ceratophorum* (Ledeb.) DC. The *Taraxacum*, in immature condition, was collected late in July, and in the hope of securing mature material Professor Pease and the writer descended King's Ravine through the southwest gully on August 8, 1917. The snow had only just disappeared from many of the banks and the *Taraxacum* was not found, but of much greater interest was a trailing willow which carpeted in great profusion the wet mossy banks at altitudes above 1310 m. (4300 feet). The shrub was first noticed when we were at an altitude of about 1375 m. (4500 feet) but it may occur higher up the gully. In the dark lustrous green, prominently reticulated veins and closely crenate margins of the leaves the shrub at first suggested *Salix herbacea* L.; but the leaves were oblong to narrowly obovate and narrowed at base, not rounded to reniform and cordate at base as in *S. herbacea*, and the coarse woody freely forking superficial branches (3–6 mm. thick) trailed often to a length of 5 dm. from the central trunk. The shrub was, then, obvi-

[1] Pease, Rhodora, xix. 111 (1917).

ously not a phase of *S. herbacea;* and when, after reaching this decision, we found it abundantly fruiting, the departure from *S. herbacea* became more pronounced, for the new shrub has densely many-flowered aments, in fruit 1.5–3 cm. long, resembling those of *S. Uva-ursi* Pursh.

The latter species, *S. Uva-ursi,* is the only other trailing willow of the New England mountains, but, unlike *S. herbacea* and the coarser shrub of King's Ravine which occur on wet mossy knolls and banks, *S. Uva-ursi* characterizes the most exposed and arid ledges and gravels. The new shrub differs from the common xerophytic *S. Uva-ursi* in many characters. The branches and branchlets of *S. Uva-ursi* are stiff and straightish, the branchlets subascending; those of the King's Ravine shrub very flexuous and closely appressed to the moss and humus. In *S. Uva-ursi* the usually elliptical leaves are acute or acutish, whitened beneath, subentire or at most remotely serrate, and the surfaces are scarcely if at all papillose; but in the King's Ravine shrub the oblong or narrowly obovate leaves are obtuse or rounded at summit, bright green and lustrous beneath as well as above, closely crenate-dentate, and (under a lens) distinctly papillose above and often beneath. In its ament-characters, so far as shown by the fruiting material, the King's Ravine shrub is very similar to *S. Uva-ursi,* but has longer capsules than are usual in that species.

Altogether the King's Ravine shrub differs so pronouncedly from both of its allies, *S. herbacea* and *S. Uva-ursi,* that it seems worthy specific separation. It is possible that it long ago originated by the hybridization of these two species, but at present it is so uniform and characteristic over a large area of the Ravine and so definitely fertile that its present status is not open to question. The shrub seems to be quite distinct from any described arctic-alpine species and its only previous collections seem to have been by Dr. Pease in 1909 and again in 1913 in King's Ravine. It is, therefore, highly appropriate that it bear the name of the keen and untiring explorer of the White Mountain flora, Arthur Stanley Pease, who shared in its discovery; and to those who are familiar with Dr. Pease's well-earned reputation as an alpine explorer there is a singular propriety in dedicating to him a plant which, like him, finds itself at home on the almost inaccessible wet cliffs of a mountain ravine.

The new species is proposed as

Salix **Peasei**, n. sp., frutex depressus, ramis decumbentibus vel repentibus flexuosis ligneis 1.5–5 dm. longis 3–6 mm. diametro atro-castaneis lucidis, ramulis prostratis vel assurgentibus valde flexuosis pilosis glabratis; foliis membranaceis glabris reticulatis plerumque perviridibus lucidisque supra valde papillosis ellipticis vel anguste obovatis obtusis vel apice rotundatis crenato-dentatis 0.8–2.3 cm. longis 0.4–1.9 cm. latis, petiolo 2–5 mm. longo; amentis fructiferis terminalibus pedunculatis 1.5–3 cm. longis 0.7–1 cm. diametro, pedunculo 4–9 mm. longo albido-piloso; squamis ellipticis vel anguste obovatis obtusiusculis fuscis 2 mm. longis albido-pilosis, pilis 1 mm. longis; capsulis conico-subulatis glabris 5–6 mm. longis purpurascentibus, stylo tenui 0.6–0.8 mm. longo, stigmatibus valde bifidis adscendentibus, pedicello 0.5 mm. longo nectarium subaequante.

Depressed shrub; the branches decumbent or repent, flexuous, ligneous, 1.5–5 dm. long, 3–6 mm. in diameter, blackish-chestnut, lustrous; the branchlets prostrate or assurgent, very flexuous, pilose and glabrate: leaves membranaceous, glabrous, reticulated, very green and lustrous on both surfaces, obviously papillose above, elliptical or narrowly obovate, obtuse or rounded at summit, crenate-dentate, 0.8–2.3 cm. long, 0.4–1.9 cm. broad; petiole 2–5 mm. long: fruiting aments terminal, peduncled, 1.5–3 cm. long, 0.7–1 cm. in diameter; peduncle 4–9 mm. long, white-pilose: scales elliptical or narrowly obovate, obtusish, fuscous, 2 mm. long, white-pilose, the hairs 1 mm. long: capsules conic-subulate, glabrous, 5–6 mm. long, purplish; style slender, 0.6–0.8 mm. long; stigmas deeply 2-cleft, ascending; pedicel 0.5 mm. long, about equaling the nectary.— New Hampshire: trailing on wet mossy banks at 1310–1375 m. (4300–4500 ft.), southwest gully of King's Ravine, Low & Burbank Grant, July 27, 1909, *Pease*, no. 12,091, July 26, 1913, *Pease*, no. 14,433, August 8, 1917, *Fernald & Pease*, no. 16,847 (type in Gray Herb.).

Gray Herbarium.

ADDITIONS TO THE FLORA OF CONNECTICUT.

(*Continued from page 130.*)

Ranunculus allegheniensis Britton. Occasional in northwestern Connecticut.

* Thalictrum dasycarpum Fisch. & Lall. Thickets: Groton (Weatherby), New London (Graves), Franklin (R. W. Woodward, Rhodora, xv. 95).

* Hepatica americana (DC.) Ker, forma candida Fernald. Rhodora, xix. 46 (1917). Occasional with the typical form.

H. acutiloba DC. Simsbury, 1837 (specimen in Shurtleff herb. at Wesleyan University; no collector given). In the Catalogue reported only from western Connecticut.

† Clematis florida Thunb. Woodbridge (Chas. F. Hull). The collector states that this species has been growing beside a brook for several years. Frequently cultivated. Native of Japan.

C. verticillaris DC. Killingly (C. H. Knowlton, Rhodora, xiii. 31). In the Catalogue not reported from Windham Co.

Coptis trifolia (L.) Salisb. Stamford (W. H. Hoyt). In the Catalogue not reported near the coast west of New Haven.

* Actaea rubra (Ait.) Willd., forma neglecta (Gillman) Robinson. Rich, rocky woods on the north slope of Canaan Mt., North Canaan (Harger & Weatherby). Also reported from Mt. Totoket, North Branford (O. Harger in "Berzelius" Catalogue).

At the station in North Canaan a single plant of the form was found growing with *A. rubra* and *A. alba.* The berries of *A. rubra* and forma *neglecta* were mature. Those of *A. alba* were half-grown. Growing near was another plant with the slender pedicels of *A. rubra* but with the half-grown fruit of *A. alba* and with leaves more nearly like the latter. The different combinations of characters suggest that one or both of these forms may be of hybrid origin.— E. B. Harger.

Sassafras variifolium (Salisb.) Ktze. Rare in dry woods, Oxford (Harger). Frequent near the coast.

* S. variifolium (Salisb.) Ktze., var. albidum (Nutt.) Fernald. Rhodora, xv. 16 (1913). Stonington (Bissell, Harger & Weatherby). Frequent at Oxford (Harger). This variety is distinguished by its glabrous and glaucous leaves and twigs. The ranges of this and of the preceding are not definitely known.

Draba caroliniana Walt. Middletown (Joseph Barratt), Canaan (Bissell & Weatherby), Salisbury (Mrs. C. S. Phelps). Extensions of range northward.

Alyssum alyssoides L. Middlebury (Harger), Waterbury (A. E. Blewitt).

Lepidium Draba L. One plant in a field, East Granby (E. J. Winslow & A. F. Hill). Abundant by roadsides, Norwalk (Eames).

† L. perfoliatum L. Old cultivated field, Barkhamsted (A. E. Blewitt). Fugitive from Europe.

† Coronopus didymus (L.) Sm. Well established locally about the harbor at Westport (Eames). Adventive from Europe.

Camelina microcarpa Andrz. Adventive at Middlebury as a persistent weed on borders of cultivated fields and along paths (Harger). In the Catalogue reported only as fugitive.

Neslia paniculata (L.) Desv. Waterbury (A. E. Blewitt).

Conringia orientalis (L.) Dumort. Waterbury and Barkhamsted (A. E. Blewitt). Apparently increasing in frequency about the more settled districts but nowhere well established (Eames).

Sisymbrium officinale (L.) Scop. Several additional stations in southwestern Connecticut.

† S. incisum Engelm., var. Hartwegianum (Fourn.) Wats. Waste ground where street sweepings had been dumped, Waterbury (A. E. Blewitt). Fugitive from the northwestern United States.

S. Sophia L. New Haven (J. P. Brace, Rhodora, xvi. 86).

Dentaria maxima Nutt. Hartland (Bissell & Weatherby).

Arabis hirsuta (L.) Scop. Guilford (G. H. Bartlett), New Haven (J. A. Allen; specimen in Herb. Conn. Agr. Exp. Sta.), Ridgefield, on limestone (Eames & C. C. Godfrey). Not previously reported near the coast west of Old Lyme or in Fairfield Co.

* A. viridis Harger. Rhodora xiii. 36 (1911). Dry ledges, more often on trap: Scotland (Weatherby), East Granby (Harger), Hamden (A. E. Blewitt), Woodbury (Eames & C. C. Godfrey), Southbury (type station, Harger).

This species, formerly included under *A. laevigata*, may be distinguished from that species by its green color, lyrate-pinnatifid basal and lower stem-leaves which are not clasping, and by its much later flowering season, about May 20th to July 1st.

Podostemum ceratophyllum Michx. Plymouth (H. J. Bassett, 1861). In the Catalogue not reported from Litchfield Co.

Tiarella cordifolia L. Bank of Saugatuck River in Weston (W. J. Comstock). An extension of range southwestward.

Mitella nuda L. Norfolk and Goshen (Eames & C. C. Godfrey).

Philadelphus coronarius L. Near an old cellar, Beacon Falls (A. E. Blewitt).

P. inodorus L. With the last, Beacon Falls (A. E. Blewitt).

† Hydrangea paniculata Sieb. One thriving plant near the railway at Stamford (W. H. Hoyt). Fugitive from the southern states.

† H. quercifolia Bartr. A large and thrifty colony on a hillside in Norwalk, where probably spread from cultivation many years ago (Eames). Native of the Gulf states and not usually considered hardy anywhere in New England.

Ribes nigrum L. Huntington and Easton (Eames).

* R. triste Pall., var. albinervium (Michx.) Fernald. Rare. In a cold swamp, Cornwall (Weatherby).

Physocarpus opulifolius (L.) Maxim. Escaped from cultivation at Bridgeport and Norwalk (Eames).

Spiraea prunifolia Sieb. & Zucc. This usually occurs in the double-flowered form common in cultivation, but the single-flowered type is well established along a roadside in Fairfield (Eames).

Cydonia japonica (Thunb.) Pers. Roadside, Seymour (Harger).

* Amelanchier stolonifera Wiegand. Rhodora, xiv. 144 (1912). Rare. Dry sandy or rocky ground: Waterford and East Lyme (Graves), Old Lyme (Bissell & Weatherby), Tolland and East Hartford (Weatherby), Suffield (Harger), Southington (Bissell, Rhodora, xiv. 146). In the Catalogue included under *A. oblongifolia*.

A. canadensis (L.) Medic. *A. canadensis* (L.) Medic., var. *tomentula* Sarg. Extends across the western part of the state. Rare near the coast, becoming occasional northward.

* A. sanguinea (Pursh) DC. *A. spicata* Gray's Man. Ed. 7. *A. rotundifolia* Roem. Rare. Calcareous ledges, on the bank of the Housatonic River, Salisbury (A. E. Blewitt & Harger).

Crataegus foetida Ashe. Occasional in New London Co. (Graves), East Windsor (Bissell), Southington (Andrews).

* C. rotundifolia Moench., var. Faxoni (Sarg.) Eggleston. Occasional in New London Co. (Graves), Killingly (Bissell).

* C. roanensis Ashe. Rare. Old pasture, Hartford (Bissell).

C. macrosperma Ashe. Frequent and widely distributed.

* C. MACROSPERMA Ashe, var. PASTORUM (Sarg.) Eggleston. Litchfield (Bissell).

C. MACROSPERMA Ashe, var. MATURA (Sarg.) Eggleston. Widely distributed.

* C. MACROSPERMA Ashe, var. VIRIDIMONTANA (Sarg.) Eggleston. *C. viridimontana* Sarg. Litchfield and Salisbury (Bissell).

* C. NAPAEA Sarg. should stand as a good species.

* C. PRUINOSA (Wendl.) K. Koch, var. INCISA (Sarg.) Eggleston. Included in the Catalogue among the forms of uncertain status as *C. incisa* Sarg.

* C. DELTOIDES Ashe. East Windsor (Bissell), Washington (Miss Knowles).

C. JESUPI Sarg. should be omitted from our flora.

C. HOLMESIANA Ashe. Hartford (Bissell).

C. PRINGLEI Sarg. should be omitted from our flora (as to the typical form only).

C. POLITA Sarg. Newington and Litchfield (Bissell).

* C. POLITA Sarg., var. TATNALLIANA (Sarg.) Eggleston. Pawcatuck Point, Stonington (Bissell, Harger and Weatherby).

* C. BRAINERDII Sarg., var. EGGLESTONII (Sarg.) Robinson. Occurs at Stratford and Litchfield (Bissell).

* C. MACRACANTHA Lodd., var. NEOFLUVIATILIS (Ashe) Eggleston. Occurs at Litchfield and Salisbury (Bissell).

Notes on *Crataegus* are for the most part from specimens determined by W. W. Eggleston.

† FRAGARIA GRANDIFLORA Ehrh. Waste ground, Bridgeport (Eames). Fugitive from Europe.

POTENTILLA INTERMEDIA L. Brookfield (A. E. Blewitt).

P. RECTA L. More frequent than stated in the Catalogue and locally abundant.

P. TRIDENTATA Ait. Colebrook (G. E. Nichols).

† FILIPENDULA ULMARIA (L.) Maxim., var. DENUDATA (Hayne) Maxim. Established along a roadside, Salisbury (Eames & C. C. Godfrey). Native of Europe.

KERRIA JAPONICA (Thunb.) DC. East Lyme (Graves), Westport (Eames).

* ? RUBUS NEGLECTUS Peck. Ledyard (Mrs. C. B. Graves), Waterbury and Barkhamsted (A. E. Blewitt). In the Catalogue reported only from Oxford.

R. PHOENICOLASIUS Maxim. Plainville (Andrews). Several additional stations have been observed in the southwestern part of the state, where, no doubt, it has been partly distributed by birds.

† R. ROSAEFOLIUS Smith. Rare. At a time said to have been more than twenty years ago, introduced into a garden in Huntington, where it became a nuisance. Efforts have been made to eradicate it, but a small colony persists in a rocky waste on the premises. The flowers are single and it is said to form some fruit. (Eames and C. C. Godfrey). Native of the Orient.

* R. CANADENSIS L. Most of the material referred in the Catalogue to *R. Randii* belongs under this species, which occurs through northern Connecticut as far east as Union (Graves) and as far south as Danbury (A. E. Blewitt). One specimen collected at Salisbury by Bissell agrees well with authentic material of *R. Randii;* but *R. Randii* is probably only a weak form of *R. canadensis.*

AGRIMONIA PARVIFLORA Ait. Stamford (W. H. Hoyt).

A. ROSTELLATA Wallr. Kent (Eames).

ROSA SPINOSISSIMA L. Prospect (A. E. Blewitt), Brookfield (Eames).

R. CANINA L. Portland (Mrs. F. W. Starmer, RHODORA, xiii. 31), Fairfield (Eames), Salisbury (Mrs. C. S. Phelps, RHODORA, l. c.), Stamford (W. H. Hoyt).

R. NITIDA Willd. Plainfield (Bissell, RHODORA, xiii. 31).

* PRUNUS VIRGINIANA L., var. LEUCOCARPA Wats. Rare. Fence-rows: Southington (Andrews), Seymour (Harger).

P. INSTITITIA L. Redding (M. L. Fernald, Eames & C. C. Godfrey).

P. NIGRA Ait. River-bank and fields: Salisbury (A. E. Blewitt & Harger), Sharon (Weatherby). Apparently native at the former station.

† P. AMERICANA Marsh., var. MOLLIS Torr. & Gray. Roadsides and fence-rows: Thompson (Weatherby), Lyme (Harger), East Granby (Bissell, H. S. Clark & Weatherby, RHODORA, xiii. 31), Oxford (Harger), Woodbury (Eames & C. C. Godfrey). Introduced from the central United States. The Oxford station known to be an introduction from Iowa.

† GYMNOCLADUS DIOICA (L.) Koch. Kentucky Coffee Tree. Hillside at Norwalk where no parent tree exists at present (Eames). Introduced from the central United States.

† TRIFOLIUM DUBIUM Sibth. Rare. Three stations, one abundant,

at Fairfield (Eames & C. C. Godfrey), Middletown (W. R. Dudley; specimen in Herb. Yale University). Adventive from Europe.

† COLUTEA ARBORESCENS L. Rare. A small colony on a roadside bank, Milford (Eames). Introduced from Europe.

† ANTHYLLIS VULNERARIA L. Kidney Vetch. In ground where potting soil from greenhouses had been spread, Cromwell (Mrs. S. V. Hubbard, RHODORA, xiii. 240). Fugitive from Europe.

† ASTRAGALUS CANADENSIS L. In the herbarium of Wesleyan University is a specimen of this species labelled: "Rock Falls, near Middletown, Ct., June 10, 1879. Hewitt, '79, legit."

LESPEDEZA SIMULATA Mackenzie & Bush. Waterbury (A. E. Blewitt).

* L. HIRTA (L.) Hornem., var. OBLONGIFOLIA Britton. Glastonbury (Mrs. F. W. Starmer, RHODORA, xiii. 31).

* L. CAPITATA Michx., var. STENOPHYLLA Bissell & Fernald. RHODORA, xiv. 92 (1912). Sandy soil: Groton (Graves), Glastonbury (Bissell).

† ARACHIS HYPOGAEA L. Peanut. Waste ground, Waterbury (A. E. Blewitt). Fugitive from tropical regions.

VICIA TETRASPERMA (L.) Moench. Thomaston (A. E. Blewitt), Salisbury (Mrs. C. S. Phelps), Oxford (Harger).

VICIA HIRSUTA (L.) S. F. Gray. Waterbury (A. E. Blewitt). Associated with *V. tetrasperma* at Fairfield (Eames) and Greenwich (W. H. Hoyt).

V. VILLOSA Roth. This vetch, now much used as a cover crop, is escaping quite freely to roadsides and waste places and sometimes persists two to three years in fields where it has been sown.

LATHYRUS PALUSTRIS L., var. LINEARIFOLIUS Seringe. Waterford (Graves), Bridgeport (Eames).

* L. PALUSTRIS L., var. PILOSUS (Cham.) Lædeb. Groton and Old Lyme (Graves), Old Saybrook (Harger). Referred to var. *linearifolius* in the Catalogue. See RHODORA, xiii. 51.

LENS ESCULENTA Moench. Waterbury (A. E. Blewitt).

AMPHICARPA PITCHERI Torr. & Gray. Chester (Harger). In the Catalogue not reported east of Southington.

LINUM MEDIUM (Planch.) Britton. Granby (B. B. Bristol).

* L. FLORIDANUM (Planch.) Trel., var. INTERCURSUM (Bicknell) Weatherby. RHODORA, xviii. 224 (1916). Pasture in rather moist sandy soil, East Hartford (Weatherby).

*Geranium Bicknellii Britton. Rare. Dry soil: Meriden (A. E. Blewitt), Kent (H. Mosher).

G. pusillum Burm. f. New London (Mrs. A. V. DeWitt).

Polygala Nuttallii Torr. & Gray. Voluntown (Harger).

Euphorbia polygonifolia L. Occurs inland as a weed in waste ground at Hartford (H. S. Clark).

E. Esula L. Roadsides, Greenwich (Eames & W. H. Hoyt).

*Ilex monticola Gray, var. mollis (Gray) Britton. Woods, Torrington (W. E. Campbell, Rhodora, xiv. 205). This plant should be looked for in Salisbury, as it has been found in Mt. Washington, Mass., within a mile of the state line.

I. verticillata (L.) Gray, var. tenuifolia (Torr.) Wats. Occasional throughout western Connecticut.

I. laevigata (Pursh) Gray. Stafford (Weatherby). Not previously reported from Tolland Co.

Evonymus alatus (Thunb.) Rupr. & Maxim. Occasional over much of the state.

E. atropurpureus Jacq. Waterbury (A. E. Blewitt).

Acer platanoides L. Freely escaping at Seymour (Harger).

Aesculus Hippocastanum L. Bank of Shetucket River, Norwich (Graves).

Rhamnus alnifolia L'Hér. Durham (Weatherby), Guilford and North Branford (W. R. Dudley; specimens in Herb. Yale University), Brookfield and Southbury (Harger). In the Catalogue not reported south of Cornwall.

† R. Frangula L. Beaver Meadows, New Haven (G. E. Nichols). Introduced from Europe.

Parthenocissus quinquefolia (L.) Planch., var. hirsuta (Donn) Planch. *Psedera quinquefolia* (L.) Greene, var. *hirsuta* (Donn) Rehder. Haddam and Danbury (Weatherby), Waterbury (A. E. Blewitt), Oxford (Harger), and frequent in dry, rocky woods on the trap ridges of central Connecticut. In the Catalogue reported only from Litchfield Co.

Vitis bicolor LeConte. Oxford (Harger) and rare or occasional throughout southwestern Connecticut.

† Anoda triangularis DC. Yard where grain-screenings had been scattered, Southington (H. Whitney). Fugitive from the southwestern United States.

Hypericum majus (Gray) Britton. Killingly (Weatherby), Bark-

hamsted (A. E. Blewitt), Hartland (Bissell & Weatherby). Not previously reported from Windham Co. or northern Connecticut west of the Connecticut River.

* HUDSONIA ERICOIDES L. Sand-banks and sandy woods, Voluntown (A. W. Evans & G. E. Nichols).

LECHEA MARITIMA Leggett, var. INTERIOR Robinson. Enfield and Suffield (Bissell & R. W. Woodward, RHODORA, xiii. 31), Plainfield (Mrs. Henry Dorrance). Northward extensions of range.

L. LEGGETTII Britton & Hollick. Branford and Oxford (Harger). In the Catalogue reported only from New London Co.

* VIOLA EMARGINATA LeConte. Low, sandy woods, Cromwell (Philip Dowell).

* V. SILKIRKII Pursh. Cold, rocky woods, Salisbury (Mrs. C. S. Phelps, RHODORA, xv. 225).

V. PRIMULIFOLIA L. Canaan (Miss Julia F. White), Salisbury (Mrs. C. S. Phelps). Not previously reported from Litchfield Co.

V. ROSTRATA Pursh. East Windsor (J. W. Robbins, about 1825; specimen in Herb. Yale University).

OPUNTIA VULGARIS Mill. On ledges of Hartland schist, Farmington (Luman Preston, about 1860, E. H. Munger). Not previously reported so far inland.

† DAPHNE MEZEREUM L. Dry hillside woods: Norfolk (reported in Crissey's History of Norfolk, p. 498; Miss M. C. Seymour, RHODORA, xvi. 96), Salisbury (Mrs. C. S. Phelps, RHODORA, l. c.). Adventive from Europe.

LYTHRUM SALICARIA L. Waterford (Graves), Windham (Miss Grace P. Bates). In the Catalogue not reported from New London or Windham Counties.

EPILOBIUM MOLLE Torr. Guilford (W. R. Dudley; specimen in Herb. Yale University).

* OENOTHERA MURICATA L. Dry soil, often on railway fills or sea-beaches: Orange and East Haven (G. E. Nichols), North Branford and Seymour (Harger). Frequent in southwestern Connecticut (Eames).

GAURA BIENNIS L. Windsor (Prof. E. P. St. John). Extension of range northward.

† CLARKIA PULCHELLA Pursh. In newly seeded grass-land: Somers (Mrs. Myrtie D. Davis), Windsor (C. R. Hathaway); Granby (I. Holcomb), New Milford (E. H. Austin). Fugitive from the northwestern United States.

* Myriophyllum alterniflorum DC. Shallow water of Tyler's Pond, Goshen. (Bissell & Weatherby).

M. spicatum L. In slow water of the Housatonic River at Oxford and Huntington (Harger). Only sterile material found but apparently well distinguished by the foliar characters.

(To be continued.)

E. B. Harger,
C. B. Graves,
E. H. Eames,
C. H. Bissell,
L. Andrews,
C. A. Weatherby.

TWO NEW POLYGONUMS FROM NEW ENGLAND.

S. F. Blake.

As the publication of a revision of the North American members of the *Polygonum aviculare* group on which the writer has been engaged for some time has been unavoidably postponed, it has seemed advisable to publish at this date descriptions of the two following new species from New England. Of these one is most nearly related to *P. erectum* L., and, as seems to be the case with that species, has not yet been found in a clearly indigenous condition. The other, somewhat related to *P. Fowleri* Robinson and *P. aviculare* L., but very distinct from either, is known from a number of collections along the coast of Maine and New Brunswick.

Polygonum **achoreum**, sp. nov. Annuum ramosum adscendens coeruleo-viride caulibus (1)1.5–3.5 dm. longis. Caulis validus striatus supra compresso-angulatus albido-viridis glaber, internodiis caulinis 1–1.5 (rare 2) cm. longis, eis ramealibus 4–8 mm. longis. Folia creberrima elliptica apice latissime rotundata basi in petiolum brevissimum (0.6–1.5 mm. longum) cuneate angustata coeruleo-viridia firma inconspicue venosa (venis ca. 5-jugis) 7.5–22.5 mm. longa 4–10 mm. lata internodia superantia, ea ramulina minora ceterum similia valde conferta. Ocreae nitenti-scariosae albidae mox laceratae (laciniis ca. 6–8) scarioso(vix fibrilloso)-persistentes conspicuae

4–9 mm. longae, basi brunneae tenuissime ca. 6–8-nerviae. Flores 1–3 in axillis fere omnibus ramealibus, pedicellis in ocreis inclusis. Calyx frugifer 3.4–4 mm. longus 2–2.5 mm. latus ovoideo-subfusiformis saepissime apice contracto subrostratus subcoeruleo-viridis membranaceo-coriaceus ad medium 5-lobatus; sepala 5 oblonga conferta achenium saepissime omnino occultans, tria exteriora anguste vel omnino non pallido-marginata dorso valde carinata non venosa apice valde cucullata, duo interiora multo breviora sublate albo-marginata evenia a sepalis exterioribus saepissime omnino occultata. Achenia inclusa rarissime paullo exserta olivacea obscure puncticulosa omnino non nitentia valde inaequaliter trigona 2.6 mm. longa 1.8 mm. lata. Stamina 3–5. Stylus brevis ad medium divisus.

Branched ascending annual, bluish-green, the stems (1) 1.5–3.5 dm. long. Stem stout, striate, compressed-angled above, whitish-green, glabrous; stem-internodes 1–1.5 (rarely 2) cm. long, the rameal 4–8 mm. long. Leaves very crowded, elliptic, broadly rounded at apex, cuneately narrowed into the very short (0.6–1.5 mm. long) petiole, firm, bluish-green, inconspicuously veined (veins about 5 pairs), surpassing the internodes, 7.5–22.5 mm. long, 4–10 mm. wide, those of the branches similar to the stem leaves but smaller, densely crowded. Ocreae lucid-scarious, whitish, weakly ca. 6–8-nerved at the brownish base, soon lacerate (lacineae ca. 6–8), scarious-persistent, scarcely at all fibrillose, conspicuous, 4–9 mm. long. Flowers 1–3 in nearly all the branch axils, on included pedicels. Fruiting calyx 3.4–4 mm. long, 2–2.5 mm. wide, ovoid-subfusiform, usually subrostrate by the contracted apex, somewhat bluish-green, membranaceous-coriaceous, divided merely to the middle; sepals 5, narrowly oblong, crowded, usually completely hiding the achene, the three outer with narrow pale margin or none, strongly carinate but not venose on the back, strongly cucullate at apex, the two inner much shorter, rather broadly whitish-margined, but this normally quite hidden by the outer sepals, veinless. Achenes included or very rarely slightly exserted, olivaceous, obscurely puncticulose, not at all shining, very unequally trigonous, 2.6 mm. long, 1.8 mm. wide. Stamens 3–5. Style short, divided to the middle.— *P. erectum* Blake! Rhodora, xv. 164 (1913), not L. — Gaspé County, Quebec, to Minnesota, Missouri, Montana and Saskatchewan, not obviously native anywhere.— Quebec: salt marsh, York, Gaspé Co., 25 Aug. 1904, *Collins, Fernald, and Pease*, (*Pease* 5604 in part); vicinity of Longueuil, Sept. 1917, *Bro. Marie-Victorin* 4262. Vermont: in paths, Queen City Park, South Burlington, 13 Aug. 1911, *Blake* 2766 (type coll.; Gray Herb. hb. N. E. Bot. Club, hb. Blake). Minnesota: St. Anthony Park, Minneapolis, 20 July 1888, *J. H. Schuette;* along path, Bald Eagle, Ramsey Co., 6 July 1910, *Blake* 210 (hb. Blake). Missouri: introduced, Sheffield, 19 July 1906, *Bush* 4060 (distr. as *P. littorale*). North Dakota: streets, Leeds, 26 July 1900, *Lunell* (distr. as *P. erectum*). Montana: roadside weed, common, Great

Northern Railway, Calais, 14 July 1900, *Blankinship;* field, 1370 m., Glacier National Park, Teton Co., 22–28 July 1913, *Hunnewell* 2063 (hb. Hunnewell). Saskatchewan: 1857–58, *Bourgeau* (distr. as *P. aviculare* var. *latifolium*).

Like its nearest relative, *Polygonum erectum* L., the present species, although pretty certainly indigenous in the United States, has apparently never been found in a clearly native condition. It is very distinct from *P. erectum* not only in the form and cutting of its calyx but also in the strongly bluish-green tint of the entire plant, the very round-tipped elliptic leaves, and the conspicuous persistent lucid-scarious not fibrillose crowded ocreae. Much more collecting must be done before the exact range and abundance of the species can be ascertained.

Polygonum **allocarpum,** sp. nov. Annuum adscendens vel subadscendens e basi ramosum ramis usque ad 5 dm. longis et ultra, cyaneo- vel luteo- vel rubescenti-viride non glaucum siccitate non obscurans. Caulis validus foliosus striatus internodiis inferioribus 2–4.5 cm. longis quam folia saepissime brevioribus. Folia caulina ovalia vel oblongo-ovalia utroque acuta vel acutiuscula tenuia plana subvenosa (venis lateralibus validioribus 4–7-jugis) 2.5–5.5 cm. longa 1.1–2.1 cm. lata, superiora et ramulina reducta, in petiolis submarginatis 2–5 mm. longis. Ocreae scariosae tenuiter ca. 10-nerviae 7–10 mm. longae mox valde laceratae plus minusve persistentes. Flores 1–3-ni in axillis mediis et superioribus, pedicellis inclusis. Calyx frugifer 3.7–4.5 mm. longus 5-lobatus, lobis oblongis apice rotundatis herbaceis margine petaloideo albido vel rosaceo-tincto conspicuo sed vix lato, costa distincta et (exterioribus) saepe nervis paucis lateralibus praeditis. Achenia exserta vel inclusa obscure olivaceo-castanea rare olivacea trigona saepius plano-convexa lateribus 2 angustioribus plus minusve concavis saepius inaequalibus rarius subaequilateraliter trigona lucida laevia 3.5–4.8 mm. longa 2.5–3 mm. lata. Stamina 5.

Annual, ascending or subascending, branched from the base, the branches up to 5 dm. long or more, bluish-, yellowish- or reddish-green, not darkening in drying, not glaucous. Stem stout, leafy, striate, the lower internodes 2–4.5 cm. long, usually exceeded by the leaves. Leaves oval or oblong-oval, acute or acutish at both ends, thin, flat, subvenose (lateral veins 4–7 pairs), 2.5–5.5 cm. long, 1.1–2.1 cm. wide, on submargined petioles 2–5 mm. long, the upper and the branch-leaves smaller. Ocreae scarious, weakly about 10-nerved, soon strongly lacerate, more or less persistent, 7–10 mm. long. Flowers in clusters of 1–3 in the middle and upper axils, on included pedicels. Fruiting calyx 3.7–4.5 mm. long, 5-lobed, the lobes oblong, rounded at apex, herbaceous with petaloid whitish or rosy-tinged conspicuous

but not very broad margin, distinct midrib and (outer sepals) often a few lateral nerves. Achenes exserted or included, dull olivaceous-castaneous or olivaceous, shining, smooth, trigonous, usually plano-convex with two sides narrower and somewhat concave, and usually unequal, sometimes subequally trigonous, 3.5–4.8 mm. long, 2.5–3 mm. wide. Stamens 5.— Sea coast, Maine and adjacent islands of New Brunswick.— NEW BRUNSWICK: sand, Campobello I., 4 Aug. 1909, *A. B. Klugh* 13. MAINE: strand, Pleasant Point, Perry, 16 Aug. 1909, *Fernald;* strand, eastern side of Moose I., Passamaquoddy Bay, 16 Aug. 1909, *Fernald* (TYPE in Gray Herb.); sandy and gravelly strands, Dark Harbor, Islesboro, 14 Aug. 1913, *Woodward, Bissell & Fernald* 9391; sand beach, Great Head, Mt. Desert, 11 Sept. 1905, *C. F. Batchelder;* shore, Southwest Harbor, 2 Sept. 1890, 24 Sept. 1893, *Rand;* Fernalds Point, Mt. Desert, 16 Aug. 1909, *Rand;* shore, Norwoods Cove, 18 Sept. 1892, *Fernald;* shingle, Little Cranberry I., 24 July 1899, *Williams;* beaches, Great Cranberry I., 5 Sept. 1891, 29 Aug. 1892, *Rand;* Swans Island, Aug. 1911, *Furbish;* Damariscotta River, Boothbay, 10 Aug. 1900, *Morss;* Cape Newagen, Southport, 7 Aug. 1894, *Fernald.*

Polygonum allocarpum may easily be recognized by its large leaves, lack of glaucosity, and large shiny achenes. Its nearest relative is perhaps one of the larger forms of the *P. aviculare* alliance, from which it is at once distinguished by achenial characters alone. From *P. Fowleri* Robinson, with which it has been confused, it differs in the much larger fruit, the thinner more veiny and usually larger leaves, the longer more persistent ocreae, and the more or less ascending habit. From *P. Raii* it is too widely different to require detailed comparison.

GRAY HERBARIUM.

FURTHER NOTES ON THE ORCHIDS OF THE ASQUAM REGION.— In my note on the orchids of the Asquam Lake, N. H., region, printed in RHODORA for March 1917, no mention was made of finding *Pogonia affinis,* although a specimen suspected of being this species had been collected. More recent investigation (June 29–July 9, 1917) proves the plant in question to be *P. affinis.* This species has not, so far as I know, been previously reported from New Hampshire. As only three plants (two in blossom) were found it did not seem advisable to do much collecting, although I took one specimen for my herbarium. Unfortunately the blossom was lost, but the leaves are still preserved in rather poor condition. I also have two specimens of the capsule.

The members of Camp Algonquin have added two species to their list:

Habenaria dilatata var. *media* (Rydb.) Ames — one plant near a spring on Red Hill.

Habenaria macrophylla Goldie — one plant on Shepard Hill.

Orchis spectabilis L., *Habenaria blephariglottis* (Willd.) Torr., and *Arethusa bulbosa* L. have also been reported from this vicinity.— Albert Edgar Lownes, Providence, Rhode Island.

Installation of the Peck Testimonial Exhibit.— The late Charles Horton Peck, State Botanist of New York from 1867 to 1915, made his name familiar outside of strictly botanical circles, to a widely scattered and constantly increasing number of amateurs, especially those interested in the fleshy fungi. To their inquiries for information in regard to these perplexing plants he was always ready with an interested and painstaking reply. With the means at his command he endeavored in his annual reports to increase and spread popular knowledge of the poisonous and edible species, and this object he kept before him assiduously for over forty years, so that his name became and will remain associated with these plants in America more widely than that of any other botanist.

As a fitting memorial of this service, there has been installed in the State Museum of New York a series of life-size models of certain conspicuous species. To quote from a recent letter from H. D. House, the present State Botanist of New York:

"The final installation was completed only a few days prior to his [Mr. Peck's] death which occurred on July 10, 1917. The models, 57 in number, and representing 55 species are the work of Mr. Henri Marchand, an artist and sculptor of rare ability. The models are made of wax from casts in the field, and reproduce with perfect fidelity to nature, the form, coloring and habitat of each species."

The many friends and beneficiaries of the late mycologist will not fail to recognize the peculiar fitness of this testimonial.— H. W.

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THE VARIETIES OF CHIMAPHILA UMBELLATA.

S. F. Blake.

The common Pipsissewa or Wintergreen (*Chimaphila umbellata*) has long been regarded as a species of comparatively uniform characters and of a very wide range, including Eurasia from south-central Siberia to Norway, Germany, Austria, and Switzerland, the greater part of North America from New Brunswick and Quebec southward interruptedly to the mountains of Chiapas[1] and westward to the Pacific, and the Japanese Islands. It has also been recorded[2] recently from Santo Domingo, but the specimens from that island prove to represent a very distinct endemic species, which I have elsewhere described[3] as *Chimaphila domingensis*. Aside from an unsuccessful attempt by Alefeld[4] in 1856 to distinguish specifically between the plant of eastern North America and that of western North America and Europe, no division of the species had been proposed until very recently except by DeCandolle, who described the Mexican form as a variety in 1839. But when a large amount of material, representing nearly the whole range of the species, is examined, several rather marked and nearly constant differences appear between the plant of Eurasia and Japan on the one hand and the American forms on the other; and the latter, when carefully studied, prove to be divisible

[1] My reference of the plant to Guatemala, Journ. Bot. lii. 169 (1914) was apparently due to a slip of the pen, as I can find no record of specimens.

[2] Urb. Symb. Ant. v. 453 (1908).

[3] Blake, Journ. Bot. lii. 169 (1914). The record by Rydberg (N. Am. Fl. xxix. 31 (1914)), who recognizes *C. domingensis*, of *C. corymbosa* (= *C. umbellata*) from Santo Domingo is undoubtedly erroneous.

[4] Alefeld, Linn. xxviii. 78–84 (1856).

into at least four geographically isolated varieties. One of the differences between the American and European forms had been noted by J. E. Smith as long ago as 1814 ("1819"), in his revision of the genus for Rees's Encyclopaedia (xxix. no. 11), where he remarks, after describing *Pyrola umbellata:* "The American specimens are usually less umbellate, and more racemose, than the European."

In his recent revision of *Chimaphila* in the North American Flora,[1] Dr. Rydberg has restricted *C. umbellata* to Europe and divided the North American material hitherto referred to that species into four. One of these, *C. mexicana,* is the Mexican plant distinguished as a variety by DeCandolle in 1839. The eastern plant is called *C. corymbosa,* a name proposed by Pursh in 1814 as a new name for the transferred *Pyrola umbellata* of Linnaeus. A western plant, *C. occidentalis,* ranging from British Columbia to California, is described, and a southwestern one, *C. acuta,* from Arizona and New Mexico. Of the true *Chimaphila umbellata* Dr. Rydberg says:[2] "This is a European species with which our American species has been confused, differing from *C. corymbosa* in the smaller subovoid capsule, which is thicker below the middle, ovate sepals, longer than broad, shorter stamens, and obtusish leaf-blades. Alefeld, who distinguished the two, admitted *C. umbellata* to the west coast, but his specimens were evidently depauperate northern ones of *C. occidentalis.*" The diagnostic characters of the American representatives of *C. umbellata* are thus indicated in Dr. Rydberg's key.

Dilated portion of the filaments glabrous or merely ciliolate on the margin; leaves oblanceolate or spatulate, not mottled.
Sepals fully as broad as long, mostly obtuse.
Leaf-blades with rather indistinct lateral veins; pedicels ascending, not recurved; stem terete.....1. *C. occidentalis.*
Leaf-blades with more prominent lateral veins; pedicels in anthesis spreading, recurved; stem more or less round-angled.
Plant 1–2 dm. high; capsule 5–6 mm. in diameter.
Dilated portion of the filaments obovate, ciliolate; pedicels glandular-granuliferous.....2. *C. corymbosa.*
Dilated portion of the filaments ovate, not ciliolate; pedicels glabrous.....3. *C. domingensis.*
Plant 2–3 dm. high; capsule nearly 1 cm. in diameter.....4. *C. mexicana.*
Sepals longer than broad, acute.....5. *C. acuta.*

While the differential characters brought out in this key are confirmed for the most part by the abundant material examined, their

[1] Rydb. in Britton, N. Am. Fl. xxix. 30–32 (1914).
[2] Rydb. l. c. 32.

true value and the relationship of the plants concerned are considerably obscured by a treatment which ranks all of these as species. Thus *C. domingensis*, whose presence so far from the normal range of the genus may be compared with that of the remarkable Crossbill[1] recently discovered in the mountains of the same island, is sharply separated from all the other plants of this group by its ovate glabrous filaments, its perfectly glabrous peduncles and pedicels, very small and bluntly few-toothed leaves, and finely erose but scarcely glandular-ciliolate sepals. On the other hand, the plants called by Rydberg *C. umbellata*, *C. occidentalis*, *C. corymbosa*, *C. mexicana*, and *C. acuta* agree in the possession of obovate ciliolate filaments, densely glandular-granular peduncles and pedicels, larger more or less sharply toothed leaves, and ciliolate sepals; while the differential characters brought forward for their specific separation are confined to differences in size, in the prominence of the venation, the shape of the sepals, the direction of the pedicels, and the rotundity of the stem, characters which are not only rather obscure but at best are merely comparative, and are shown by the material examined to be by no means absolutely constant. Thus the venation in the leaves of western specimens of *C. umbellata* is sometimes although rarely nearly or quite as prominent as in eastern plants, while the shape of the stem, in herbarium specimens at least, is not to be depended upon to distinguish specimens from the two areas; and the character of the pedicels, whether ascending or spreading, is a feature not without variation in both forms. Both the eastern and western forms of the United States not infrequently attain the dimensions assigned to the Mexican form. The fruits of the Mexican specimens examined measure 7.5–8.5 mm. in diameter, none of them being "nearly 1 cm." thick, while in some of the western examples (*C. occidentalis*) capsules 7.5 mm. in diameter are found. In seven sheets of the southwestern form (*C. acuta*), including the type, not more than half have the ovate acute sepals on which the species was based, although they do show diagnostic and constant characters in the shape and toothing of their leaves. In fact, the variation in sepal-form in the seven sheets from this region (Arizona and New Mexico) is greater than that shown by all the other specimens of *C. umbellata* (*sensu lato*) which I have examined from Eurasia, North America, and Mexico.

[1] *Loxia megaplaga* Riley, Smiths. Misc. Coll. lxvi. no. 1. 15 (1916).

The specific separation of the plant of eastern North America from that of Europe, originally proposed by Alefeld and seconded by Rydberg, is based on differences of comparatively slight moment. Alefeld[1] in 1856 attempted to distinguish two species, *C. umbellata* (*sensu stricto*), from Eurasia and the Pacific coast of North America, with stigma half as broad as ovary and dull capsule broadest below the middle, and *C. corymbosa* Pursh (as to descr., not syn.), from eastern North America, with stigma three-quarters the breadth of ovary, and shiny capsule broadest above the middle. His division, however, was based on comparatively slight material from America, and I have been unable to trace such differences in the abundant material examined, although a very slight distinction in the absolute breadth of the stigma is shown by the material from the two areas. The additional features brought out in Dr. Rydberg's description of *C. umbellata* (of Europe) are merely average comparative differences of slight consequence, and in connection with two or three others indicated in the detailed descriptions given beyond are of such a character as to show that the plants are at most only varietally separable.

The following descriptive key will serve to show the diagnostic characters of the varieties of *Chimaphila umbellata.*

Leaves rather prominently veined beneath.
  Capsule 5–6 mm. in diameter.
    Plant usually smaller (about 1.5 dm. high); leaves smaller (usually about 3.5 cm. long), blunt, not mucronulate, with fewer (4–13, usually 8–9) blunt teeth; flowers umbellate, rarely subracemose; sepals usually ovate, slightly longer than broad; stigma 1.9–2.3 mm. broad; Eurasia Var. *genuina.*
    Plant usually larger (2 dm. high or more); leaves larger (4–7 cm. long), acute or rarely obtuse, mucronulate, with more numerous (6–18, usually 10–12) sharp teeth; flowers usually more or less racemose; sepals depressed-triangular or oval, usually broader than long; stigma 2.3–2.5 mm. broad; eastern North America.....Var. *cisatlantica.*
  Capsule 7.5–8.5 mm. thick; plant stout, 2–3.5 dm. high; leaves large (5–7 cm. long), with 7–13 acute teeth, very strongly veined beneath; flowers racemose; sepals deltoid, usually longer than broad; stigma 2.3–2.7 mm. broad; Mexico.....Var. *mexicana.*
Leaves obscurely veined beneath.
  Plant stoutish, 1.5–3 dm. high; leaves acute, mucronulate, 3–9 cm. long, with 10–18 acute teeth extending nearly to base; flowers usually racemose, strongly rose-tinted; pedicels usually ascending; sepals depressed-deltoid, longer than broad, blunt; capsule 6–7.5 mm. thick; stigma 2.3–2.6 mm. broad; British Columbia to California.....Var. *occidentalis.*
  Plant small, 1–1.7 dm. high; leaves usually narrowly oblanceolate, acute, mucronulate, with 4–8 teeth on each side above the middle, 3.5–5.8 cm. long; flowers racemose or subumbellate, the pedicels ascending or diverg-

[1] Alefeld, Linn. xxvii. 78–84 (1856).

ing; sepals usually ovate and longer than broad, from acuminate to rounded; capsule 5–6 mm. thick; stigma 2.6–3 mm. broad; New Mexico and Arizona.....Var. *acuta*.

CHIMAPHILA UMBELLATA (L.) Bart. Veg. Mat. Med. U. S. i. 17. t. 1 (1817); Nutt. Gen. i. 274 (1818).— *Pyrola umbellata* L. Sp. i. 396 (1753). *P. frutescens* Gilib. Fl. Lithuan. v. 195 (1782), a mere renaming of the European plant. *Chimaphila corymbosa* Pursh! Fl. Am. Sept. i. 300 (1814); Alefeld, Linnaea xxviii. 81 (1856); Rydb. in Britton, N. Am. Fl. xxix. 32 (1914). *C. occidentalis* Rydb. l. c. 30 (1914); *C. corymbosa, C. mexicana, C. acuta* Rydb. l. c. 31.

Var. **genuina**. Planta saepius humilior 1.5–2.4 dm. alta (saepissime ca. 1.5 dm.); folia cuneata apice saepissime obtusa et non mucronulata utroque 4–13 (saepissime 8–9) dentibus obtusis praedita infra paullum venosa saepius ca. 3.5 cm. (rarius usque ad 5 cm.) longa (petiolis inclusis) 0.9–1.7 cm. lata; flores saepissime 3–6 umbellati rare subracemosi, pedicellis anthesi divergentibus; sepala saepissime ovata obtusa paullo longiora quam lata plus minusve erosa et glandulari-ciliolata; capsula 5–6 mm. diametro; stigma 1.9–2.3 mm. latum.— *Pyrola umbellata* L., as to Eurasian plant. *P. frutescens* Gilib. *Chimaphila corymbosa* Pursh, as to syn. in part. *C. umbellata* Bart. as to syn. in part; Alefeld, l. c. 78, in part; Rydb. l. c.— Among the specimens examined, the following may be cited. SWEDEN: Åhus, *Kindberg* (Fries, Hb. Norm.); Westerwik, 1902, *C. Pleijel.* GERMANY: Driesen, Neumark, *Lasch* (distr. L. Reichenbach 462); pine forests near Spire, Rhenish Bavaria, 1853, *F. G. Koch* (distr. Billot 3655). AUSTRIA-HUNGARY: Weisskirchen, Bohemia, 1911, *Petrak* 661; Schleinz and Walpersbach, *Kerner* 2586; near Güns, 260 m., *Waisbecker* (distr. Kerner 2586, in part). SIBERIA: Sagalien, *Faurie* 30 & 610 (Brit. Mus.). JAPAN: Island of Yezo, *Faurie* 6791 (Brit. Mus.), *Maximowicz, Albrecht, Miyabe, Tokubuchi, Arimoto.*

Var. **cisatlantica**. Planta saepius major saepissime 1.5–2.8 dm. alta; folia cuneata vel cuneato-obovata vel cuneato-lanceolata acuta vel acutiuscula rarissime obtusa mucronulata utroque 6–18 (saepius 10–12) dentibus saepius acutis praedita (3) 4–7 cm. longa 1–2.2 cm. lata, venis infra distinctis subprominentibus; flores saepius 4–8 plus minusve racemosi rare umbellati saepius pallidi, pedicellis anthesi divergentibus vel reflexis vel non rare adscendentibus; sepala saepius depresso-triangularia vel orbicularia obtusa latiora quam longa, rare triangularia longiora quam lata et acuta vel acutiuscula rarissime ovata acuminata, glandulari-ciliolata et paullum erosa; capsula 5–6 mm. diametro; stigma 2.3–2.5 mm. diametro.— *C. corymbosa* Pursh, as to plant described, and syn. in part; Alefeld and Rydb. ll. cc.— Rimouski Co., Que., northern N. B., P. E. I., and N. S. to western Ont. and Minn., southward to Va.; also reported from Ga., but no specimens examined.— Type from NEW BRUNSWICK: dry deciduous woods, Bathurst, 15 Aug. 1913, *Blake* 5435 (in Gray Herb.). Other specimens examined: QUEBEC: vicinity of Cap-à-L'Aigle, 1905,

J. Macoun 68554, 68555; dry rocky woods, Bic, July 1904, *Collins & Fernald;* wooded crest above limestone-conglomerate cliffs and ledges, island-headland east of Baptiste Michaud's, Bic, July 1904, *Collins & Fernald.* NEW BRUNSWICK: Little Branch, Mirimichi, 1892 & 1894, *Fowler;* under small balsams in rich soil, Shediac Cape, 1914 & 1916, *Hubbard;* St. Francis Parish, July 1900, *Williams.* PRINCE EDWARDS ISLAND: dry woods, Dundee, Aug. 1912, *Fernald, Long, & St. John* 7878. NOVA SCOTIA: dry woods, near Pictou, July 1901, *Howe & Lang* 632; Smoky Mountain, Cape Breton, Aug. 1914, *Nichols* 861[1]; mountains west of Ingonish, Aug. 1914, *Nichols* 752. NEW ENGLAND: common throughout. NEW YORK: Stony Creek Ponds, Adirondack Mts., July 1899, *Rowlee, Wiegand, & Hastings;* rather rare, damp moist woods, Canton, July 1914, *Mrs. O. P. Phelps* 750. PENNSYLVANIA: Pocono Plateau, 1904, *Harshberger;* Pond Hill Station, Luzerne Co., 1892, *Heller & Halbach* 624. NEW JERSEY: Locust, July 1903, *Williams.* VIRGINIA: damp woods, Cherrydale, June 1913, *Tidestrom* 6353. ONTARIO: dry or rocky woods, Elgiver, June 1878, *J. Macoun* 1182; crevices of greenstone north of Speke's Point, Lake Nipigan, 1912, *H. E. Pulling;* woods near Snell's Lake, West Ontario, July 1889, *R. Lees.* MICHIGAN: common, woods, Keweenaw, July 1890, *Farwell* 343[1]; open pine woods, Hamlin Lake, Ludington, July 1910, *R. W. Chaney* 83. WISCONSIN: Kilbourn, 1861, *Hale.* MINNESOTA: Star Island, Cass Lake, 1914, *Pammel, Pammel, & McNutt.*— In the British Museum are specimens from "Massachusetts," *Nuttall,* and "North America," *Pursh.*

Var. MEXICANA DC. Planta valida 2–3.5 dm. alta; folia cuneato-lanceolata vel cuneato-obovata acuta mucronulata utroque 7–13 dentibus acutis praedita (3.8) 5–7 cm. longa 0.8–2 cm. lata infra valde venosa; flores 4–7 racemosi, pedicellis anthesi adscendentibus vel suberectis; sepala depresso-deltoidea vel deltoidea saepius longiora quam lata ciliolata et erosa obtusissima vel acutiuscula; capsula 7.5–8.5 mm. diametro; stigma 2.3–3.7 mm. latum.— DC.! Prod. vii. 775 (1839). *C. mexicana* (DC.) Rydb. in Britton, N. Am. Fl. xxix. 31 (1914).— Southern Mexico.— VERA CRUZ: vacqueria del Jacal, Mt. Orizaba, 3050 m., Sept. 1841, *Liebmann.* STATE OF MEXICO: forest at San Nicolas, Sept. 1865–66, *Bourgeau* 1002; near Mexico City, 1827, *Berlandier* 605 (TYPE COLL.: hb. Prod., Brit. Mus.); mountains near Mexico City, 1856, *Schmitz* 555 (Brit. Mus.); shady woods, Ixtaccihuatl, 2745–3050 m., Nov. 1905, *Purpus* 1765. CHIAPAS: 1864–70, *Ghiesbreght* 114 & 647; near San Cristobal, 2135–2685 m., Sept. 1905, *E. W. Nelson* 3204.

Var. **occidentalis** (Rydb.) Planta saepius valida 1.5–3 dm. alta; folia cuneata vel cuneato-obovata acuta mucronulata utroque 10–18 (saepius 11–13) dentibus acutis praedita 2.5–9 (saepius 3–7) cm. longa 1.1–2 (2.5) cm. lata, infra obscurissime vel haud venosa; flores

[1] These specimens are remarkable for their ovate acuminate sepals.

4–9 saepius racemosi rare umbellati saturate rosei, pedicellis anthesi saepius suberectis vel adscendentibus interdum patenti-divergentibus vel plus minusve recurvatis; sepala depresso-deltoidea longiora quam lata obtusa erosa et ciliolata; capsula 6–7.5 mm. diametro; stigma 2.3–2.6 mm. diametro.— *Chimaphila occidentalis* Rydb.! in Britton, N. Am. Fl. xxix. 30 (1914).— British Columbia to Colorado, northern Utah, and the mountains of north-central California.— BRITISH COLUMBIA: Revelstoke, 490 m., July 1905, *Shaw* 821; Beaver Valley, 1100 m., Aug. 1904, *Macmillan* (distr. Shaw 530); Cowichan Lake region, Vancouver I., June 1907, *Rosendahl* 1768; Fraser River, *Wallace;* Saturna I., 1858, *Lyall;* West Kootenay, 1861, *Lyall.* WASHINGTON: foothills, Olympic Range, July 1902, *J. M. Grant* 137; slopes of Mt. Tacoma, Aug. 1904, *J. G. Jack;* near Ft. Vancouver, ——; Valley of Swank River, Twp. 17 & 18, Range 21, Kittitas Co., 750–1800 m., 1913, *S. P. Sharples* 174; Peshatin, Okanogan Co., 425 m., July 1893, *Sandberg & Leiberg* 565; Mt. Carleton, July 1902, *F. O. Kreager* 179; Blue Mts., July 1897, *R. M. Horner* 1168; without definite locality, 1889, *Vasey* 372. OREGON: Calapooya Valley, Douglas Co., 1065 m., July 1899, *M. A. Barber* 147a; Mt. Scott, July 1899, *Barber* 41; without definite locality, 1871, *E. Hall* 355. CALIFORNIA: Mt. Shasta, 1860–62, *Brewer* 1403; l. c., 1830 m., Aug. 1903, *Copeland* (distr. Baker 3828); Hupa Indian Res., 150 m., June 1901, *Chandler* 1398; foothills south of Mt. Sanhedrin, midway between Potter Valley and Hullville, Lake Co., July 1902, *Heller* 4935; Mendocino Co., 1867, *Bolander* 6543; Sierra Valley, *Lemmon;* mounts of eastern Butte Co., 1878, ——. IDAHO: slopes of Wiesner's Peak, 1650 m., July 1895, *Leiberg* 1344; valley of Pine Creek, near Farmington, Latah Co., June 1892, *Sandberg, MacDougall, & Heller* 519 (TYPE COLL. of *C. occidentalis*); 1280 m., Tamarack, Washington Co., Aug. 1911, *June A. Clark* 167; 1370 m., Trinity, Elmore Co., Aug. 1910, *Macbride* 550. UTAH: Uintas, 2135 m., July 1869, *Watson* 746. MONTANA: Big Fork, vicinity of Flathead Lake, July 1908, *Mrs. Joseph Clemens;* Granite Canyon near Missoula, Aug. 1880, *Watson* 256; Emigrant Gulch, 1980 m., Aug. 1897, *Rydberg & Bessey* 4651. COLORADO: headwaters of Clear Creek, and alpine ridges lying east of Middle Park, 1861, *Parry.* WYOMING: Jackson's Hole, Aug. 1894, *A. Nelson* 946; near Leigh's Lake, July 1901, *Merrill & Wilcox* 1119; Laramie River, along Medicine Bow Mts., *H. Engelmann;* Laramie Peak, Aug. 1895, *A. Nelson* 1616.

Var. **acuta** (Rydb.) Planta minor 1–1.7 dm. alta; folia saepius anguste oblanceolata acuta mucronulata utroque supra medium 4–8 (saepius 5–6) dentibus acutis vel obtusiusculis praedita, 3.5–5.8 cm. longa 0.9–1.2(1.5) cm. lata, venis obscurissimis vel rare parum prominentibus; flores 3–5 racemosi rare subumbellati, pedicellis anthesi adscendentibus vel divergentibus; sepala saepius ovata longiora quam lata interdum suborbicularia, apice acuta vel acuminata vel non rare obtusa sive rotundata glandulari-ciliolata et erosa;

capsula 5–6 mm. diametro; stigma 2.6–3 mm. diametro.— *Chimaphila acuta* Rydb.! in Britton, N. Am. Fl. xxix. 31 (1914).— New Mexico and Arizona.— NEW MEXICO: Black Horse Ridge, Baldy Mtn., near Elizabethtown, 3050 m., Oct. 1898, *Mrs. O. St. John* (U. S. Nat. Herb.); Mogollon Mts., Socorro Co., Aug. 1900, *Wooton* (U. S. Nat. Herb.); near West Fork of Gila R., Mogollon Mts., Socorro Co., 2625 m., Aug. 1903, *Metcalfe* 572 (U. S. Nat. Herb.). ARIZONA: rich soil, San Francisco Mts., near Flagstaff, July 1891, *McDougal* 480 (U. S. Nat. Herb.); dry woods, near Partridge Spring, San Francisco Mts. Forest Reservation, 2000 m., July 1901, *Leiberg* 5679 (U. S. Nat. Herb.); top of "Rim-rock," Tanto Basin, 2 Aug. 1887, *Mearns* 136 (TYPE in herb. N. Y. Bot. Gard.).

Our southwestern form of *Chimaphila* was distinguished by Dr. Rydberg under the name *C. acuta*, and separated in his key by its sepals "longer then broad, acute" from all its relatives of the *C. umbellata* alliance. There is no material of *Chimaphila* from Arizona and New Mexico, the area assigned to *C. acuta* by Rydberg, in the Gray Herbarium, but through the courtesy of Dr. N. L. Britton and Mr. W. R. Maxon I have been able to examine the type sheet of *C. acuta* in the herbarium of the New York Botanic Garden and six other sheets from this region in the National Herbarium. Examination of these specimens shows that the sharply pointed sepals upon which Dr. Rydberg relied in separating *C. acuta* are not a constant feature, although sometimes strikingly developed. They vary, even in the same specimen, from acute or acuminate to obtuse, and in shape, while usually ovate and distinctly longer than broad, are sometimes suborbicular, bluntly round-tipped, and quite indistinguishable from the ordinary form of eastern or western specimens. The material examined is divided nearly equally into groups with obtuse and with acute sepals, so that the character on which the species was based can hardly be considered of sufficient constancy for use in differentiation. It is not too much to say that more variation is shown by the seven sheets of this form examined, in respect to the character of the sepals, than by all the other material of *C. umbellata* which I have seen. But although the isolation of this form has failed to fix a uniform and distinctive type of sepal upon it, it has resulted in the development of a characteristic leaf. In all the other American forms the usually broader leaves bear a noticeably greater number of teeth which extend below the middle or almost to the base of the lamina.

GRAY HERBARIUM.

ADDITIONS TO THE FLORA OF CONNECTICUT.

(*Continued from page 232.*)

SANICULA GREGARIA Bicknell. Occurs westward to North Canaan (A. E. Blewitt), Cornwall (Harger), and Salisbury (Mrs. C. S. Phelps).

S. TRIFOLIATA Bicknell. Cheshire (A. E. Blewitt), Danbury (Harger).

* OSMORHIZA LONGISTYLIS (Torr.) DC., var. VILLICAULIS Fernald. Rich woods and fence-rows: Waterbury (A. E. Blewitt), Sharon, Southbury, Oxford and Milford (Harger). Probably frequent in southwestern Connecticut.

AEGOPODIUM PODAGRARIA L. Waterbury (A. E. Blewitt), Salisbury (A. E. Blewitt & Harger). Both of the above stations are of the form with variegated leaves; the form with unspotted leaves has been found at Bridgeport (Eames).

* SIUM CICUTAEFOLIUM Schrank, var. CARSONII (Durand) Eames. RHODORA, xviii. 237 (1916). Occasional to frequent in the southern part of the state.

† APIUM GRAVEOLENS L. Celery. Waste ground in Bridgeport (Eames). Fugitive from Europe.

TAENIDIA INTEGERRIMA (L.) Drude. Haddam (C. M. Child; specimen in Herb. Wesleyan University), New Milford (Bissell). Not previously reported from the Connecticut valley.

† ANTHRISCUS CEREFOLIUM (L.) Hoffm. A weed in gardens, Salisbury (Mrs. J. R. Sanford, RHODORA, xvi. 96). Adventive from Europe.

† HERACLEUM SPHONDYLIUM L. A small clump, persistent since 1910 at least, at Bridgeport (Eames). Fugitive or adventive from Europe.

CORNUS STOLONIFERA Michx. Redding (A. H. Graves), Moses Mt., Danbury (A. H. Graves & Harger). Not previously reported south of New Milford.

† CALLUNA VULGARIS (L.) Hull. Heather. Ling. A single plant in dry woods at Woodbury (E. M. Stoddard) and one in a similar situation at Salisbury (Mrs. Donald T. Warner). Pines from European nurseries have been used for forest planting near each of these two stations, which may account for the introduction of the plant, although at neither place was it found among the pines as planted.

Ledum groenlandicum Oeder. Windham (Bissell & Weatherby); sphagnum bog near Congamond Lake, Suffield (Harger).

Rhododendron canadense (L.) BSP. Winchester and Salisbury (Mrs. C. S. Phelps). Not previously reported from Litchfield Co.

Arctostaphylos Uva-ursi (L.) Spreng. Windsor and Salisbury (Mrs. C. S. Phelps). Not previously reported from Litchfield Co.

Chiogenes hispidula (L.) Torr. & Gray. New Fairfield (A. H. Graves & Harger). In the Catalogue not reported from Fairfield Co.

Vaccinium stamineum L. Haddam (Weatherby), Burlington (Miss Julia F. White). Not previously reported east of Waterbury.

The fruit of this species is usually rated as inedible or at most tart. There are times, at least, when it attains a diameter of 1.8 cm., becomes juicy, sweet or somewhat acidulous and slightly fragrant, the translucent skin roseate or blushed.— E. H. Eames.

* V. vacillans Kalm, var. crinitum Fernald. Rhodora, xiii. 236 (1911). Glastonbury (Mrs. F. W. Starmer).

* V. corymbosum L., var. pallidum (Ait.) Gray. In a swamp near the shore at Stonington (Harger).

Lysimachia vulgaris L. Ridgefield and Danbury (A. H. Graves, Harger and R. W. Woodward). This species is occasional and thoroughly wild in roadsides, wet fields and damp thickets for some two miles along a valley.

† L. producta (Gray) Fernald. Waterbury (A. E. Blewitt & Harger). Not previously reported in New Haven Co.

Steironema lanceolatum (Walt.) Gray. Thompson (Weatherby), Plainfield (Bissell, Harger and R. W. Woodward). Not previously reported from Windham Co.

Diospyros virginiana L. This species is not limited to the grove on the beach at Lighthouse Point. Much larger trees, some of them nearly 30 ft. tall, occur in the rocky woods west of the trolley line. These trees appear native and, because of their size, older than those by the beach.— E. H. Eames.

Acerates viridiflora Ell., var. lanceolata (Ives) Gray. East Haven (O. Harger, 1885), New Haven at the type station (Harger), Oxford (Harger).

Convolvulus spithamaeus L. Glastonbury (Mrs. F. W. Starmer), Orange (Harger), Stamford (W. H. Hoyt). Eastward and southward extensions of range.

C. japonicus Thunb. Greenwich (W. H. Hoyt), Bridgeport (A. E. Blewitt).

* Cuscuta obtusiflora HBK. Rare. Shores of the Connecticut, Housatonic and Pomperaug Rivers: Windsor (G. E. Nichols), Southbury (Harger, Rhodora, xv. 66). Newtown (Bissell & Harger), Huntington (Harger & Weatherby).

C. compacta Juss. Killingly (Weatherby). Not previously reported from Windham Co.

Phlox pilosa L. Sandy roadside, Southbury, at a locality about a mile distant from the station noted in the Catalogue.

† Polemonium reptans L. Escaped from cultivation in Easton (Eames).

Cynoglossum officinale L. Stamford, at several stations (W. H. Hoyt), Naugatuck and Waterbury (A. E. Blewitt).

* C. virginianum L. Rare. Killingworth (F. W. Hall, 1874; specimen in Herb. Conn. Agr. Exp. Sta.), Stamford, rocky woods at several places (W. H. Hoyt).

C. boreale Fernald. Guilford (W. R. Dudley; specimen in Herb. Yale University).

Myosotis arvensis (L.) Hill. Southington (Andrews).

Symphytum asperum Lepechin. *S. asperrimum* Donn. Greenwich (Bissell & Weatherby).

† Phacelia linearis (Pursh) Heller. Spontaneous in newly seeded grass-land, with *Clarkia*, Windsor (C. R. Hathaway). Fugitive from the northwestern United States.

† Onosmodium occidentale Mackenzie. Waste ground, Naugatuck (A. E. Blewitt, Rhodora, xiv. 163). Fugitive from the West.

Verbena angustifolia Michx. Cromwell (M. Hitchcock, 1881; specimen in Herb. Wesleyan University). In the Catalogue not reported from the Connecticut valley.

Scutellaria parvula Michx., var. ambigua (Nutt.) Fernald. North Branford (W. R. Dudley, Harger).

Agastache nepetoides (L.) Ktze. Frequent in Stamford and Greenwich (W. H. Hoyt).

A. scrophulariaefolia (Willd.) Ktze., var. mollis (Fernald) Heller. Thomaston (A. J. Hill), Woodbury (Eames & C. C. Godfrey).

Dracocephalum parviflorum Nutt. Waste ground and cultivated fields: Waterbury and Barkhamsted (A. E. Blewitt), Bridgeport (Eames), Stamford (W. H. Hoyt).

Galeopsis Ladanum L., var. latifolia (Hoffm.) Wallr. The Catalogue report of *G. Ladanum* was based on a specimen of this variety.

Lamium hybridum Vill. Fairfield (Eames).

† Salvia verticillata L. Waste ground, Naugatuck (A. E. Blewitt). Fugitive from Europe.

S. officinalis L. Glastonbury (C. C. Hanmer).

Monarda clinopodia L. Fairfield (Eames).

† Antirrhinum majus L. Snapdragon. Rare. Waste ground, Bridgeport (Eames). Fugitive from Europe.

Mimulus alatus Ait. Middletown (A. E. Blewitt), Chester (Harger), Guilford (W. R. Dudley; specimen in Herb. Yale University).

Limosella aquatica L., var. tenuifolia (Wolf) Pers. Shore of Lake Saltonstall, Branford (R. W. Woodward). Previously reported only from tidal shores.

Ilysanthes anagallidea (Michx.) Robinson. Groton (Bissell), Plainfield (Harger). Not previously reported from eastern Connecticut.

† Digitalis ambigua Murr. Foxglove. Waste ground, East Lyme (Mrs. F. H. Dart). Fugitive from Europe.

* Veronica Anagallis-aquatica L. Water Speedwell. Ditch by railroad track, North Canaan (Weatherby, Rhodora, xiii. 32).

V. Teucrium L. Canaan (A. E. Blewitt), Huntington and Bridgeport (Eames).

V. Tournefortii C. G. Gmel. Southington (Andrews).

* Pedicularis canadensis L., forma praeclara A. H. Moore. Rhodora xvi. 128 (1914). This red-flowered form is occasional to frequent with the species throughout.

Utricularia clandestina Nutt. Cromwell (E. J. Thompson, Rhodora, xiii. 78), South Windsor (C. W. Vibert). In the Catalogue reported only from near the coast.

U. resupinata B. D. Greene. Poquonnoc Lake, Groton (T. E. Hazen).

† Sherardia arvensis L. Rare. Well established in a lawn, New Haven (A. H. Graves). Adventive from Europe.

Galium Mollugo L. Occasional throughout western Connecticut.

G. erectum Huds. Old Lyme (Graves).

* Mitchella repens L., forma leucocarpa Bissell. Rhodora, xiii. 32 (1911). Windsor and Simsbury (Miss B. C. Hitchcock), Canaan and Cornwall (Miss M. J. Whitney).

† Lonicera Morrowi Gray. Established along a fence-row, Cromwell (Mrs. S. V. Hubbard). Adventive from eastern Asia.

L. TATARICA L. Cheshire (A. E. Blewitt), Naugatuck (Harger).

L. CANADENSIS Marsh. Windsor (Weatherby), Guilford (W. R. Dudley), Redding (Eames & C. C. Godfrey).

LINNAEA BOREALIS L., var. AMERICANA (Forbes) Rehder. Cromwell (E. J. Thompson, RHODORA, xiii. 78), Salisbury (Mrs. C. S. Phelps).

† VIBURNUM LANTANA L. Established on a roadside, Fairfield (Eames). Introduced from Eurasia.

† VIBURNUM OPULUS L. A quantity along a roadside, Westport (Eames). Introduced from Europe.

* SAMBUCUS RACEMOSA L., forma CHRYSOCARPA Eames & Godfrey ex E. H. Eames. RHODORA, xviii. 239 (1916). Rocky slopes of Quonnipaug Mt., Guilford (Eames & C. C. Godfrey)

KNAUTIA ARVENSIS (L.) T. Coulter. Abundant in a field, Litchfield (A. E. Blewitt). Eastford, well established and spreading to fields and swamps (Mrs. Geo. H. Bosworth).

* CAMPANULA ULIGINOSA Rydb. Open swamps: Litchfield (W. Buell), Sharon (Bissell).

EUPATORIUM SESSILIFOLIUM L. Cheshire, Waterbury and Thomaston (A. E. Blewitt).

E. AROMATICUM L. Saybrook at Deep River (Weatherby). In the Catalogue not reported from Middlesex Co.

GRINDELIA SQUARROSA (Pursh) Dunal. South Windsor (C. W. Vibert); several plants in dry field, Oxford (Harger).

† G. LANCEOLATA Nutt. One robust plant by a roadside, Greenwich (W. H. Hoyt). Fugitive from the southwestern United States.

CHRYSOPSIS FALCATA (Pursh) Ell. North Haven at Montowese (R. W. Woodward & A. E. Blewitt), Naugatuck (A. E. Blewitt).

SOLIDAGO SQUARROSA Muhl. Southward in western Connecticut to New Milford (Eames).

S. CANADENSIS L. Middletown (J. Barratt), New Hartford (Bissell, RHODORA, xiii. 32). In the Catalogue reported only from Lyme.

* S. CANADENSIS L., var. HARGERI Fernald. RHODORA xvii. 11 (1915). Rare. Valleys of the Connecticut and Housatonic Rivers: Middletown (J. Barratt), Lyme, Oxford, Southbury and Canaan (Harger). Distinguished from *S. canadensis* by the short-villous stem and panicle. At Lyme the species and variety grow together and completely intergrade.

S. ASPERULA Desf. Occurs in southwestern Connecticut commonly where *S. sempervirens* and *S. rugosa* grow together.

Boltonia asteroides (L.) L'Hér. Bridgeport and Fairfield (Eames), Stamford (W. H. Hoyt).

† Callistephus chinensis (L.) Cass. China Aster. Waste ground: Hartford (H. S. Clark), Southington (Andrews). Fugitive from eastern Asia.

Aster divaricatus L. The forms which have been described as *A. carmesinus* Burgess and *A. persaliens* Burgess are frequent or occasional in open woodland throughout.

A. Herveyi Gray. Killingworth (F. W. Hall), Southington (Andrews).

A. spectabilis Ait. Killingworth (F. W. Hall, 1879). In the Catalogue reported only from New London Co.

A. radula Ait. Guilford (J. Barratt), Ellington (F. N. Pease), South Windsor (Bissell).

A. Lowrieanus Porter. Cheshire (Bissell & A. E. Blewitt, Rhodora, xiii. 32). Occasional in Fairfield Co. (Eames).

A. laevis L., var. amplifolius Porter. Old Lyme (Graves), Cromwell (J. Barratt), New Haven (G. E. Nichols), Milford (Harger).

A. amethystinus Nutt. Guilford (W. R. Dudley; specimen in Herb. Yale University).

A. dumosus L. Milford (Harger). Not previously reported west of Southington.

A. Tradescanti L. Southbury (Bissell) and occasional in southwestern Connecticut (Eames).

A. longifolius Lam. Suffield (Eames & C. C. Godfrey), Enfield (Bissell & R. W. Woodward, Rhodora, xiii. 33). In the Catalogue not reported from the Connecticut valley.

A. infirmus Michx. Stamford (Eames & W. H. Hoyt).

* A. ptarmicoides Torr. & Gray. Plentiful at one locality in limestone soil at Salisbury (Eames & C. C. Godfrey, Rhodora, xvi. 20).

* Erigeron ramosus (Walt.) BSP., var. septentrionalis Fernald & Wiegand. Rhodora, xv. 60 (1913). Middlebury (W. M. Shepardson), Greenwich (Cushman & Sanford).

* E. pusillus Nutt. Sandy roadside, Voluntown (J. F. Collins & M. L. Fernald); Bridgeport (Eames). For description see Rhodora, xv. 207.

Pluchea camphorata (L.) DC. Many plants in waste ground at Waterbury (A. E. Blewitt).

* Antennaria occidentalis Greene. Rare. Glastonbury (Weatherby), roadside at Barkhamsted (Harger).

GNAPHALIUM PURPUREUM L. Portland (Bissell & R. W. Woodward, RHODORA xiii. 33), Middletown (J. Barratt, 1839), Oxford (Harger). In the Catalogue reported only from New London Co.

† PARTHENIUM HYSTEROPHORUS L. One plant in waste ground at Bridgeport (Eames). Fugitive from the southern United States.

† AMBROSIA PSILOSTACHYA DC. Roadsides: Stratford and Bridgeport (H. S. Clark, RHODORA, xiii. 33). Fugitive or adventive from the western United States.

HELIANTHUS GROSSE-SERRATUS Martens. Waterbury (A. E. Blewitt), Huntington (Eames). In the Catalogue reported as apparently native at Newington. Since that time, however, another western species, *Bidens aristosa*, has been found in the same field, and it seems more likely that both were introduced and have become established.

H. TRACHELIIFOLIUS Mill. Open woods near Moosup Pond, Plainfield (Harger). Previously reported only from New Haven.

COREOPSIS LANCEOLATA L. Abundant in a dry field, Glastonbury (Weatherby), Bridgeport and Fairfield (Eames).

† C. GRANDIFLORA Hogg. Escaped from cultivation to waste ground, Bridgeport (Eames). Adventive from the southwestern United States.

† C. PUBESCENS Ell., var. ROBUSTA Gray in herb. ex E. H. Eames. RHODORA, xviii. 239 (1916). Waste ground, Bridgeport (Eames, l. c.). Adventive from the southern United States.

* BIDENS VULGATA Greene, var. PUBERULA Wiegand. Rare. Roadside, Naugatuck, perhaps introduced; and on the Connecticut River meadows at Rocky Hill, apparently native (Harger).

B. CONNATA Muhl. Stonington (Harger), Waterbury (A. E. Blewitt), Newtown (Bissell & Harger). A form with ray-flowers occurs at Branford (Harger).

B. LAEVIS (L.) BSP. Franklin (R. W. Woodward, RHODORA, xv. 95). In the Catalogue not reported east of the Connecticut valley.

B. TRICHOSPERMA (Michx.) Britton. Glastonbury (Mrs. F. W. Starmer), Hartford (H. S. Clark). The only previous record was based on an old collection at New Haven by O. Harger — a station long since destroyed.

B. ARISTOSA (Michx.) Britton. Moist ground in an old field, Newington (Mrs. C. S. Phelps).

* B. ARISTOSA (Michx.) Britton, var. MUTICA (Gray) Gattinger. Old fields and waste places: Windham (Graves; in the Catalogue

referred to *B. aristosa*), Newington, with the typical form (Mrs. C. S. Phelps), Bloomfield (Weatherby). Fugitive or adventive from the western United States.

Helenium nudiflorum Nutt. South Windsor (C. W. Vibert), Granby (I. Holcomb), Waterbury (B. B. Bristol), Middlebury (A. E. Blewitt & Harger).

Achillea lanulosa Nutt. Waterbury (A. E. Blewitt).

† A. Ptarmica L. A double-flowered form has been collected about an old cellar, Beacon Falls (A. E. Blewitt, Rhodora, xiv. 164). Waste ground, Fairfield (Eames). Fugitive from Europe.

Matricaria suaveolens (Pursh) Buchenau. Cromwell and Oxford (Harger). At Cromwell a widely spread and persistent weed.

† Chrysanthemum segetum L. Rare. In an abandoned garden, Oxford (Harger). Fugitive from Europe.

Artemisia Stelleriana Bess. Extends westward on sea-beaches to Madison; also in Milford (Eames).

† A. gnaphalodes Nutt. A small but vigorous colony in waste ground by a roadside, East Windsor (Weatherby). Adventive from the western United States.

Cacalia suaveolens L. Bank of the Housatonic River at Oxford (Harger).

† Arctium tomentosum Mill. Waste ground, Naugatuck (A. E. Blewitt, Rhodora, xii. 45). Adventive from Europe.

† A. nemorosum Lejeune. Waste ground: Waterbury (A. E. Blewitt), Huntington (Harger). Occasional in southwestern Connecticut (Eames). Adventive or naturalized from Europe.

† Carduus nutans L. Spontaneous in a garden, Ledyard (Graves). Fugitive from Europe.

C. acanthoides L. Simsbury (specimen in the Shurtleff Herbarium at Wesleyan University; no collector given).

Cirsium arvense (L.) Scop., var. integrifolium Wimm. & Grab. Well established in a field, Fairfield (Eames).

Onopordon Acanthium L. An ornamental pest at one place in Fairfield (Eames).

† Silybium Marianum (L.) Gaertn. Persistent in a garden, New Milford (E. H. Austin). Fugitive from Europe.

Centaurea Jacea L. Monroe (Harger). At this station this species and its var. *lacera* grow in company with *C. nigra* and its var. *radiata* and the four forms appear to intergrade (Harger). A similar station at Bridgeport — but no *C. nigra*, var. *radiata* (Eames).

† C. AMARA L. In grass-land, Fairfield (Eames). Adventive from Europe.

C. MACULOSA Lam. Plainfield (Mrs. Henry Dorrance), Oxford (Alfred P. Harger), Middlebury and New Fairfield (A. E. Blewitt), Kent (H. Mosher).

C. VOCHINENSIS Bernh. Ledyard (B. T. Avery, Graves), Cheshire (A. E. Blewitt).

† CNICUS BENEDICTUS L. Accidental in a garden, Kent (Miss J. F. Gregory). Fugitive from Europe.

KRIGIA AMPLEXICAULIS Nutt. Moist field at two stations, Danbury (Harger). Occasional at Stamford (W. H. Hoyt).

PICRIS ECHIOIDES L. In newly seeded grass-land, Milford (Harger).

SONCHUS ARVENSIS L. Southbury (Harger).

LACTUCA SCARIOLA L. Waterbury (A. E. Blewitt).

L. INTEGRIFOLIA Bigel. Manchester (Bissell), Middletown (J. Barratt, 1838), Torrington (Bissell & Weatherby), Stratford and Beacon Falls (A. E. Blewitt), Stamford (W. H. Hoyt), East Hartford and probably Salisbury (Weatherby). In the Salisbury plant the leaves have the characteristic oblanceolate outline of *L. integrifolia* but are entire.

CREPIS TECTORUM L. Kent (H. Mosher).

PRENANTHES ALTISSIMA L., var. HISPIDULA Fernald. Plentiful in moist woods by Salmon River, Colchester (Harger).

HIERACIUM PILOSELLA L. Oxford, a small colony (Harger), Fairfield, a considerable area (Eames).

H. FLORENTINUM All. Fields and roadsides at two stations, Salisbury (Harger, Weatherby). Introduced from Europe.

H. PRATENSE Tausch. Occasional over most of the state. A teratological form with the corollas all tubular or with very short ligules is abundant in two fields about half a mile apart in Durham (Weatherby). All the plants in both fields are of this form.

H. MARIANUM Willd. Beacon Falls (Harger), Westport (Eames).

E. B. HARGER,
C. B. GRAVES,
E. H. EAMES,
C. H. BISSELL,
L. ANDREWS,
C. A. WEATHERBY.

THE BOREAL AND SUBALPINE VARIETY OF SPIRAEA LATIFOLIA.

M. L. Fernald.

Spiraea latifolia (Ait.) Borkh., as it occurs through most of its range, has the leading or primary inflorescence pyramidal-paniculate, the lower branches of the panicle being distinctly elongate. Its secondary inflorescences are less pyramidal in outline and are often subcylindric or ellipsoid; but all well-developed or uninjured specimens show the characteristic pyramidal terminal or primary panicle.

In Newfoundland and eastern Saguenay County, Quebec, however, *S. latifolia* departs from the more widely distributed shrub with pyramidal primary panicles in having all the panicles of a cylindric or subcylindric form, the lower branches of the inflorescence scarcely if at all exceeding the subtending leafy bracts; and the only collection from the Magdalen Islands, although somewhat transitional, is nearer the Newfoundland shrub than to the widely distributed shrub of the mainland.

In 1915, while collecting on the Franconia Range of the White Mountains the writer was impressed by the similarity of the subalpine form of *Spiraea latifolia* to the shrub of Newfoundland, and during the past summer, while exploring Huntington's Ravine and the Alpine Garden of Mt. Washington with Professors A. W. Evans and A. S. Pease, he was again struck with the strong resemblance of the subalpine and alpine shrub with the Newfoundland plant and its pronounced departure from the lowland *S. latifolia*.

Examination of all the material in the Gray Herbarium and the herbarium of the New England Botanical Club shows these field-impressions to have been well founded; for the alpine and subalpine specimens, from Mt. Katahdin, Maine, and the Carter, Presidential and Franconia Ranges of New Hampshire, agree with the Newfoundland specimens in their cylindric or subcylindric primary panicles. On many of the specimens, from all three areas, the flowers are somewhat larger than in much of the pyramidal-panicled shrub of lower latitudes or altitudes, but some specimens from low altitudes in New England show quite as large flowers. As geographic varieties, differing primarily in the form of the primary panicle, the two are well

defined. From the original description of *S. salicifolia, γ latifolia* Ait., "racemis paniculatis," upon which *S. latifolia* (Ait.) Borkh. was based, it is apparent that Aiton was describing the common plant with definitely paniculate inflorescences. The two varieties of the species may therefore be designated

SPIRAEA LATIFOLIA, var. **typica**. *S. salicifolia, γ latifolia* Ait. Hort. Kew. ii. 198 (1789). *S. latifolia* (Ait.) Borkh. Handb. Forstbot. 1871 (1803).— Primary inflorescences pyramidal.

Var. **septentrionalis**, n. var., inflorescentiis primariis cylindricis vel subcylindricis.

Primary inflorescences cylindric or subcylindric.— NEWFOUNDLAND: roadsides, St. John's, July 31, 1894, *Robinson & Schrenk*, no. 22; sandy and gravelly banks of Waterford River between Waterford Bridge and St. John's, August 2, 1911, *Fernald & Wiegand*, no. 5663; swampy pasture, Topsail, August 12-19, 1901, *Howe & Lang*, no. 1271; bushy slopes of sandstone and arenaceous slate hills back of Carbonear, August 6 & 7, 1911, *Fernald & Wiegand*, no. 5664; ledges, talus and gravel, north bank of Exploits River, Bishop Falls, July 28, 1911, *Fernald, Wiegand and Darlington*, no. 5663; ledges and talus, north bank of Exploits, Grand Falls, July 22, 1911, *Fernald, Wiegand, Bartram and Darlington*, no. 5601 (TYPE in Gray Herb.). QUEBEC: edge of slough in the dunes, Natashquan, Saguenay Co., July 4, 1915, and September 5, 1915, *St. John*, nos. 90,522, 90,523. MAGDALEN ISLANDS: sand hills between East Cape and East Point, Coffin Island, August 17, 1912, *Fernald, Long and St. John*, no. 7562. MAINE: Depot Pond, Mt. Katahdin, July 16, 1900, *E. F. Williams*. NEW HAMPSHIRE: wall of Alpine Garden, alt. 6000 ft., Mt. Washington, August 7, 1896, and August 5, 1897, *E. F. Williams;* Lake of the Clouds, Mt. Washington, August 4, 1891, *B. L. Robinson*, no. 1002; upper slope of Alpine Garden, August 5, 1891, *B. L. Robinson;* 4½ miles up Mt. Washington Carriage Road, Sargent's Purchase, August 19, 1907, *A. S. Pease*, no. 10,543; 5 mile Sign on Carriage Road, Thompson & Meserve Purchase, August 12, 1910, *A. S. Pease*, nos. 12,832, 12,833; Fan, Huntington's Ravine, Sargent's Purchase, August 7, 1917, *Fernald & Pease*, no. 16,882; peaty soil near Imp Camp, alt. 3500 ft., Bean Purchase, August 4, 1917, *A. S. Pease*, no. 16,763; south side of Mt. John Quincy Adams at about 5000 ft., September 6, 1906, *A. S. Pease*, no. 9890; granitic gravel and peaty slopes, alpine and subalpine region of Mt. Lafayette, Franconia, July 17 and 18, 1915, *Fernald & Smiley*, no. 11,714; granitic gravel and peaty slopes, western spur of Mt. Lincoln, Franconia, August 11, 1915, *Fernald*, no. 11,716.

GRAY HERBARIUM.

NOTE ON FRUIT OF MOUNTAIN MAGNOLIA.—The writer's attention was called to a curiously misshapen fruit cone from a mountain magnolia (*Magnolia acuminata* L.). Investigation showed that the original tree, as well as others in the vicinity, bore a large quantity of similar ones. It will be remembered that the fruit of this species superficially resembles some of the larger, and more cylindrical, pine cones, and is ordinarily 3 or 4 in. in length. The abnormal fruits, for their part, were lumpy in appearance, unsymmetrical in development, corkscrew in shape, or otherwise twisted about their long axis, some resembling the head of a bird in shape, and all shorter.

With the view of ascertaining the probable cause of this abnormal development, the writer made dissections of a number of cones. No sign of insect injury, or parasitic growth was found, but on the other hand, there were evident differences in the size of the fleshy follicles composing them, accounted for by the size of the seeds within them. The abnormal fruits contained numerous ovules which had evidently never been fertilized, and the corresponding portions of the cone showed signs of atrophy. The seeds in this fruit are described as being distributed 1 or 2 in each carpel; 2 seeds were noted, but in half of the cases examined, one had never developed. These cases were interesting since there seemed to be plenty of opportunity for cross-pollination. It was apparently clear then that the distortion of the fruits was due primarily to want of complete pollination resulting in an uneven distribution of maturing seeds throughout the cone, the development of the seeds producing the mechanical force requisite.— N. M. GRIER, Central High School, St. Louis, Mo.

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Rhodora

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A REMARKABLE COLONY OF BIDENS IN CONNECTICUT.

M. L. Fernald.

In September, 1910, Messrs. R. W. Woodward and C. H. Bissell collected on the strand of Lake Pocotopaug at Chatham, Connecticut, material of an abundant *Bidens* which was afterwards, in 1915, referred to the writer for his opinion. The plants were of two quite definite strains and superficially somewhat resembled *B. connata* Muhl., var. *petiolata* (Nutt.) Farwell in its most extreme development, the oblong to lance-ovate leaves being all on very slender elongate petioles. Unlike any form of *B. connata*, however, all the material from Pocotopaug Lake was consistent in having the achenes quite flat and always two-awned, exactly matching the achenes of *B. heterodoxa* (Fernald) Fernald & St. John,[1] a species hitherto known only from maritime habitats on Prince Edward Island and the Magdalen Islands.

As above stated, there were two distinct strains of the plant from Pocotopaug Lake, the larger plants having the two awns of the achene consistently retrorse-barbed, as in most species of *Bidens*, and in this exactly matching the achenes of *Bidens heterodoxa*, var. *orthodoxa;* the smaller plant of the strand (mostly much smaller than the plant with retrorsely-barbed awns) having the awns quite smooth and barbless or at most with very obscure suggestions of barbs, appearing as a slight scabrous tendency on the awns. These plants, presenting, as they did, the achene-characters of *B. heterodoxa*, a species known only from subsaline situations about the Gulf of St.

[1] Fernald & St. John, Rhodora, xvii. 23 (1915).

Lawrence, were naturally very perplexing since it would be surprising, at least, to find *B. heterodoxa* upon an inland lake of Connecticut. Consequently, plans were made for the writer to join Mr. Woodward in a further field-study of the colony. Unfavorable weather, however, forced the abandonment of this plan and on September 21, 1915, Mr. Woodward alone visited the station and collected an abundant series of specimens, many sheets of which have been generously supplied to the writer; and these plants in all their characters agree with the earlier collections.

A close study of the material shows it to have exactly the achene of *B. heterodoxa* and to be consistently two-awned. A check-study of *B. connata* and its varieties shows that in that species all well developed central achenes of the heads are consistently 4-awned and with the highly developed mid-ribs becoming almost wing-like in maturity. It would appear, then, that the Pocotopaug Lake material must, at least for the present, be placed with *B. heterodoxa,* although it is geographically remote from the type region of the latter species. In this geographic isolation, however, the plant is comparable with many other characteristic species of Prince Edward Island, the Magdalen Islands and eastern New Brunswick, which are outlying representatives of austral types isolated by hundreds of miles from the nearest known stations to the south,[1] and it is probable that further exploration, especially in the coastwise strip of southern New England, will reveal colonies of *B. heterodoxa* in the intermediate area.

In typical *B. heterodoxa* the leaves are either simple or 3–5-parted, the blades of the simple leaves or the terminal lobes of the cleft ones being narrowly lanceolate to narrowly ovate and very sharply (almost jaggedly) serrate. In the Connecticut material, however, the leaves as above stated, strongly resemble those of *B. connata,* var. *petiolata,* or, in some cases, typical *B. connata,* the simple leaves being oblong-lanceolate to ovate-lanceolate and rather bluntly dentate, the cleft leaves with the terminal lobe of this form; and in all the plants the leaves are on very elongate slender petioles. Furthermore, the Connecticut material has the flowering branches highly developed but very short in the axils, most of these branches being much shorter

[1] For example: *Carex varia* Muhl., abundant on Prince Edward Island but unknown nearer than Hancock Co., Maine; *Rumex persicarioides* L. (See St. John, Rhodora, xvii. 80) of the lower St. Lawrence, Quebec, Prince Edward Island, and eastern Massachusetts; and *Aster subulatus* Michx., var. *obtusifolius* Fernald, Rhodora, xvi. 61, of northeastern New Brunswick, there representing *A. subulatus,* which reaches its northern limit in southern New Hampshire.

than the subtending leaves. In this peculiar habit and in the foliage the plants are well characterized and it seems wisest to give them a varietal designation, although it is freely admitted that at present we do not know of transitional colonies. The two plants of Pocotopaug Lake may, then, be called

BIDENS HETERODOXA (Fernald) Fernald & St. John, var. **monardaefolia**, n. var., planta racemose ramosa, ramis brevibus axillaribus; foliis simplicibus vel 3-partitis longe petiolatis, laminis vel lobis terminalibus oblongo-lanceolatis vel lanceolato-ovatis grosse dentatis; aristis acheniorum retrorse setosis.

Plant racemosely branched; branches short, axillary: leaves simple or 3-parted, long-petioled; the blades or terminal lobes oblong-lanceolate or lance-ovate, coarsely dentate: awns of the achenes retrorsely setose.—CONNECTICUT: strand of Lake Pocotopaug, Chatham, September 21, 1910 and September 21, 1915, *R. W. Woodward* (TYPE in Gray Herb.).

B. HETERODOXA, var. **agnostica**, n. var., habitu foliisque ut apud var. monardaefoliam; aristis acheniorum laevibus vel obsolete scabris.

Habit and foliage as in var. *monardaefolia:* awns of the achenes smooth or obscurely scabrous.—CONNECTICUT: strand of Pocotopaug Lake, Chatham, September 21, 1910, *R. W. Woodward and C. H. Bissell* (TYPE in Gray Herb.); September 21, 1915, *R. W. Woodward.*

GRAY HERBARIUM.

ARENARIA LATERIFLORA AND ITS VARIETIES IN NORTH AMERICA.

HAROLD ST. JOHN.

IN 1862 Regel, after studying Eurasian and Alaskan specimens, described a series of varieties of *Möhringia lateriflora* (L.) Fenzl, using as diagnostic characters the shape and the pubescence of the leaves. The occurrence of one of these varieties in a collection of plants recently made in northern Manitoba by Mr. J. H. Emerton has involved the writer in a study of the Eurasian and North American material of this species and has led him to the belief that the seemingly artificial characters used by Regel do really define recognizable categories whose distributions are similar to those of many other boreal types.

Consequently it has seemed worth while to systematize the American treatment of this species and to make the necessary new combinations under *Arenaria*, in which genus the species seems properly placed. The differences between the varieties are stated in the following key:

A. Leaves elliptical or ovate-lanceolate.
  B. Leaves puberulent on the margins and on the midribs beneath, or occasionally puberulent throughout.
    1. *A. lateriflora* L., var. *typica* (Regel) St. John.
  B′. Leaves glabrescent or glabrous.
    2. *A. lateriflora* L., var. *glabrescens* (Regel) Robinson.
A′. Leaves linear, linear-elliptic, or linear-lanceolate.
  C. Leaves puberulent on the margins and the midribs beneath, occasionally puberulent throughout.
    3. *A. lateriflora* L., var. *angustifolia* (Regel) St. John.
  C′. Leaves glabrous.....4. *A. lateriflora* L., var. *Taylorae* St. John.

It will be seen that Regel's β. *intermedia* has not been taken up. It has not seemed advisable to try to separate the broad, pubescent-leaved plants into those with "elliptical obtuse or rarely acute leaves" (Regel's α. *typica* sensu stricto) as opposed to those with "oblong-elliptic or oblong-lanceolate obtuse or rarely acute leaves" (Regel's β. *intermedia*). If such a distinction can be drawn, it does not seem to be of any taxonomic or phytogeographic importance.

1. Arenaria lateriflora L., var. **typica** (Regel) n. comb. *Möhringia lateriflora* (L.) Fenzl, var. *typica* Regel, Fl. Ostsibirien i., Bull. Soc. Nat. Mosc. xxxv. 377 (1862).— Perennial with slender terete minutely retrorsely pubescent stems which are simple or freely branching especially at the base, 0.5–4 dm. high: leaves bright green, opposite, entire, sessile, slightly connate, elliptical or ovate lanceolate, puberulent on the margins and on the midribs beneath, occasionally throughout, 5–30 mm. long, 3–14 mm. wide: inflorescence lateral or becoming so, cymes one or more borne from the upper axils, 1–6-flowered; pedicels subtended by minute paired bracts, one or more of the uppermost pedicels bibracteolate near the middle; sepals green, hyaline-margined, ovate, obtuse, glabrous, 2–3 mm. long; petals usually exceeding the sepals 2–3 times.[1]— Abundant on gravelly and turfy shores, in thickets and borders of woods, and meadows, Arctic America south to Pennsylvania, Ohio, Ill., S. Dakota, Missouri, and the mountains of Montana, Idaho, Colorado, Utah, New Mexico, Washington, and Oregon; also in boreal Eurasia. A few typical specimens in the Gray Herbarium and the Herbarium of the New England Botanical Club are cited below:

Labrador: springy banks and damp hillsides, Forteau, July 30, 1910, *M. L. Fernald & K. M. Wiegand*, no. 3,347. Newfoundland:

[1]For notes on the variations in the size and proportions of the floral parts, see Woodward, R. W.: Rhodora xv. 209–10 (1913).

grassy strand of Ingornachoix Bay, August 2, 1910, *M. L. Fernald & K. M. Wiegand*, no. 3,346. QUEBEC: wet thicket, Brion Island, Magdalen Islands, August 5, 1914, *Harold St. John*, no. 1,869. PRINCE EDWARD ISLAND: sandy thickets, Morell, June 29, 1914, *M. L. Fernald & Harold St. John*, no. 11,051. NEW BRUNSWICK: alder thicket, Shediac Cape, July 3, 1914, *F. T. Hubbard*. NOVA SCOTIA: damp thicket, near Pictou, July 12–18, 1901, *C. D. Howe & W. F. Lang*, no. 461. MAINE: moist field, Roque Bluffs, July 8, 1907, *C. H. Knowlton*. NEW HAMPSHIRE: Isle of Shoals, *Oakes & Robbins*. VERMONT: Rutland, *W. W. Eggleston*, no. 1,073. MASSACHUSETTS: low ground, Eastern Point, Gloucester, June 7, 1896, *E. L. Rand & B. L. Robinson*. RHODE ISLAND: low grounds near beach, Westerly, June 7, 1913, *R. W. Woodward*. CONNECTICUT: moist woods, Guilford, June 17, 1906, *G. H. Bartlett*. NEW YORK: on mounds in sandy pasture, south side of Oneida Lake, Lenox, June 6, 1900, *J. V. Haberer*, no. 120. PENNSYLVANIA: swamp near Lancaster, June 1, 1860, *T. C. Porter*. ONTARIO: Kingston, June 14, 1902, *J. Fowler*. MICHIGAN: Dickinson's Island in Lake St. Clair, Port Huron, June 18, 1899, *C. K. Dodge*. OHIO: Port Clinton, May 16, 1898, *E. L. Moseley*. ILLINOIS: cliffs and open woods, Starved Rock, June 1–7, 1909, *J. M. Greenman, O. E. Lansing, Jr., & R. A. Dixon*. MANITOBA: Churchill, Hudson Bay, August 5, 1910, *J. M. Macoun*, C. G. S., no. 79,086. MINNESOTA: Twin Lake, May 1891, *E. P. Sheldon*. NORTH DAKOTA: dry ground, Portal, June 13, 1903, *M. A. Barber*, no. 348. SOUTH DAKOTA: Elk Canon, altitude 4,000–5,000 feet, June 29, 1892, *P. A. Rydberg*, no. 568. SASKATCHEWAN: 1858, *E. Bourgeau*, no. 14. ALBERTA: dry prairie, Calgary, June 19, 1903, *M. A. Barber*, no. 224. MONTANA: Big Fork, July 22, 1908, *Mrs. Joseph Clemens*. IDAHO: frequent on dry soil, head of Little Potlatch River, June 16, 1892, *J. H. Sandberg, D. T. MacDougal, & A. A. Heller*, no. 399. WYOMING: aspen copses on the hillsides, Glen Creek, Yellowstone Park, June 30, 1899, *A. & E. Nelson*, no. 5,588. UTAH: wet canyon bottom, Pine Flats, July 11, 1912, *E. P. Walker*, no. 239. NEW MEXICO: Rio Pecos, below Winsor's Ranch, altitude 8,200 feet, July 1, 1908, *P. C. Standley*, no. 4,163. WASHINGTON: near Rock Lake, altitude 550 m., May 30, 1893, *J. H. Sandberg & J. B. Leiberg*, no. 123. BRITISH COLUMBIA: Avalanche Path, Emerald Lake, Selkirk Mountains, altitude 4,400 feet, *C. F. Shaw*, no. 92. YUKON: common in shady places, Dawson, June 7, 1914, *Alice Eastwood*, no. 160a. ALASKA: Unalaska, *Eschscholtz*.

2. A. LATERIFLORA L., var. GLABRESCENS (Regel) Robinson, in Synopt. Fl. i. part 1. 238 (1897). *Möhringia lateriflora* (L.) Fenzl, *γ glabrescens* Regel, Fl. Ostsibirien i., Bull. Soc. Nat. Mosc. xxxv. 378 (1862).— Resembling the var. *typica* in the shape of the leaves, but differing in having them glabrate or glabrous, and often thinner and brighter green.— Apparently this variety is commoner in northern Asia than it is in North America. Only two collections of it from this continent have been seen by the author.

IDAHO: willow copses, House Creek, Owyhee Co., June 28, 1912, *A. Nelson & J. F. Macbride*, no. 1,758. COLORADO: Leroux Creek, Delta County, altitude 9,500 feet, July 10, 1892, *J. H. Cowen*, no. 81.

3. A. LATERIFLORA L., var. **angustifolia** (Regel) n. comb. *Möhringia lateriflora* (L.) Fenzl, δ *angustifolia* Regel, Fl. Ostsibirien i., Bull. Soc. Nat. Mosc. XXXV. 378 (1862). In greater part *A. lateriflora* L., var. *tenuicaulis* Blankinship, Montana Agric. College Sci. Studies, Botany, i. 51 (1905).— Like the var. *typica* except in having linear, linear-elliptic, or linear-lanceolate leaves, 10–26 mm. long, 2–6 mm. wide.— Growing with or replacing the var. *typica* in western Canada, the Rocky Mountains, southern Labrador, and south along the New England coast.

ALBERTA: river bottom, Calgary, June 18, 1903, *M. A. Barber*, no. 191. SASKATCHEWAN: Wood Mountain Post, June 12, 1895, *J. Macoun*, C. G. S., no. 10,101. MANITOBA: mile 214, Hudson Bay Railway, July 8, 1917, *J. H. Emerton*. MONTANA: Flathead Lake, July 6, 1902, *M. J. Elrod*, no. 154; descent to Ross' Hole, July 26, 1880, *S. Watson*. UTAH: moist bank, altitude 8,000 feet, La Sal Mountains, June 13, 1914, *E. Payson*. QUEBEC: Seven Islands, August 2, 1907, *C. B. Robinson*, no. 663. MAINE: dry meadow, Hamilton Cove, Lubec, August 2, 1909, *M. L. Fernald*, no. 1,754. MASSACHUSETTS: Yarmouth, May 31, 1903, *J. Murdoch, Jr.*, no. 1,312. RHODE ISLAND: low grounds near beach, Westerly, July 11, 1913, *R. W. Woodward;* in woods, east side of Abbot Run, Cumberland, May 29, 1892, *J. F. Collins*.

4. A. LATERIFLORA L., var. **Taylorae** n. var., foliis glabris. Cetera ut apud var. *angustifoliam*.

Resembling var. *angustifolia*, but having glabrous leaves.— Known only from the region of the delta of the Mackenzie River, where it was twice collected by Miss Elizabeth Taylor. To her, in recognition of her collecting in several high northern regions, the variety is dedicated.

NORTH WEST TERRITORIES: Peel's River Post, near the Mackenzie delta, July 13, 1892, *Miss E. Taylor*, no. 27; Peel's River near the Mackenzie delta, July 15, 1892, *Miss E. Taylor*.

In the treatment of this group in the Synoptical Flora [1] Dr. Robinson cited one of these two sheets as var. *glabrescens*. Later Blankinship included this number in his var. *tenuicaulis*. Blankinship at some time annotated on one of the two sheets, "near var. *angustifolia* (Regel) l. c., J. W. B." It will be seen that this collection has been a thorn in the flesh of the students of this group, and in view of the characters stated in the foregoing description, the author feels justified in describing it as a new variety.

GRAY HERBARIUM.

[1] Synopt. Fl. i. part 1. 238 (1897).

NOTES ON NEW ENGLAND HEPATICAE,— XIV.[1]

Alexander W. Evans.

In 1915 Warnstorf [2] described and figured as a new species, under the name *Sphenolobus ascendens*, a specimen collected by Miss Lorenz at Waterville, New Hampshire. The specimen had been sent him as *Scapania glaucocephala* (Tayl.) Aust., but he failed to find the *Scapania* and suggested that there might have been an error in the determination. The Waterville material had been named by the writer, and had served as the basis for his observations on *S. glaucocephala*, published in 1909.[3] In view of a possible error this material has been carefully reëxamined, but there seems to be no reason for revising the original determination. Mixed with the *Scapania*, however, are several other species of Hepaticae, such as *Cephalozia curvifolia*, *Jamesoniella autumnalis*, *Harpanthus scutatus*, and *Lophozia porphyroleuca*. The last species occurs as a slender gemmiparous form and is not abundant, but the few plants present agree with Warnstorf's description and figures of *Sphenolobus ascendens*. The writer would therefore regard the *Sphenolobus* as a synonym of the *Lophozia*.

During the past two years Miss Lorenz [4] has recorded a number of species additional to the hepatic floras of Maine, New Hampshire, and Vermont, respectively. These species, with a single exception, were found by Miss Lorenz herself. The additions for Maine, collected on Mt. Ktaadn, are *Cephaloziella bifida*, *C. byssacea* (listed as *C. Starkii*), *Gymnomitrium corallioides*, *Lophozia Kunzeana*, *Nardia Geoscyphus*, and *Scapania dentata*. The only addition for New Hampshire, collected along the Connecticut River at Claremont, is *Riccia arvensis*. The additions for Vermont, collected at various localities, are *Riccia arvensis*, *R. Frostii* (first record for New England), *Ricciella crystallina*, *Cephalozia macrostachya*, *Lophozia heterocolpa*, *L. longidens*, and *Radula tenax*.

Attention should likewise be called to an interesting observation

[1] Contribution from the Osborn Botanical Laboratory.

[2] Hedwigia **57**: 63. *f. 2.* 1915.

[3] Rhodora **11**: 194. 1909.

[4] Bryologist **20**: 43–45. 1917; Vermont Bot. & Bird Clubs, Joint Bull. **2**: 14. 1916; Joint Bull. **3**: 7, 8. 1917.

by Howe[1] on *Riccia Lescuriana*. According to his studies this species, published by Austin in 1869, is a synonym of *R. Beyrichiana* Hampe, published by Lehmann in 1838. The species, therefore, should bear the earlier name.

In the present series of Notes the following three species are recorded from New England for the first time: *Scalia Hookeri, Harpanthus Flotowianus*, and *Calypogeia fissa*. The distinctive features of these species are discussed, further mention is made of *Riccia Frostii*, and several additions to local state floras are given.

1. RICCIA FROSTII Aust. Bull. Torrey Club **6**: 17. 1875. *R. Watsoni* Aust. *l. c.* *R. Beckeriana* Steph. Bull. Herb. Boissier **6**: 374. 1898. Clayey banks of the Connecticut River, Ascutneyville, Weathersfield, Vermont, July 15, 1916 (*A. Lorenz*). The species has a wide distribution in North America and the following stations may be cited from the literature: Genessee Falls, Rochester, New York, 1868 (*P. T. Cleve*); near Painesville, Ohio (*H. C. Beardslee*); Illinois (*J. Wolf*); Bloomington, Indiana (*C. L. Black*); banks of the Missouri River, St. Charles, Missouri (*C. H. Demetrio*); Manhattan, Kansas (*W. A. Kellerman*); South Dakota (*Williams*); Great Falls, Montana (*F. W. Anderson*); Colorado (*J. Wolf*); near Denver, Colorado (*C. C. Parry, E. Bethel*); Idaho (*J. B. Leiberg*); Nevada (*S. Watson*). The last named specimen, sent to Austin by C. C. Frost, should be regarded as the type of the species.

In 1898 Heeg[2] announced the occurrence of the species from the following localities in the Old World: Sarepta, Russia (*A. Becker*); Vienna, Austria (*A. Pokorny*); Gorelevo, Fatjanova and Polovinka, Siberia (*H. W. Arnell*). In 1912 Massalongo[3] recorded it from two stations in Italy, namely: Sermide (*A. Manganotti*) and Francolini, province of Ferrara (*A. Fermioli*). In 1913 it was reported by Schiffner[4] from the vicinity of Makó, Hungary (*J. Györffy*) and from Mesopotamia, Asia Minor (*H. von Handel-Mazzetti*). Stephani considered the Russian specimens distinct from *R. Frostii*, describing them as new under the name *R. Beckeriana*, but K. Müller[5] reduces Stephani's species to synonymy, maintaining that it comes within the range of variability to be expected in a species.

[1] Bryologist **20**: 33. 1917.
[2] Bot. Notiser 1898: 24.
[3] Atti R. Ist. Veneto **71**: 852. *f.* 7. 1912.
[4] Oesterr. Bot. Zeitschr. **63**: 455. 1913.
[5] Rabenhorst's Kryptogamen-Flora **6**: 210. *f. 138*.

In the absence of fresh material the writer has been unable to make a satisfactory study of the present species, but the published descriptions and figures bring out most of its essential characters clearly. Aside from the works of Heeg, Massalongo, and K. Müller, already alluded to, reference may be made to Underwood's account in the 6th edition of Gray's Manual, to Howe's critical observations in connection with the Hepaticae of California,[1] and to Miss Black's comprehensive morphological study.[2] Howe emphasizes the features of the spores, which distinguish the species from all known California *Ricciae*. He describes them as narrowly margined, 45–55 μ in maximum diameter, and covered over almost uniformly "by numerous short, delicate, wavy ridges which rarely anastomose." These peculiarities will serve equally well to separate *R. Frostii* from the other New England species of *Riccia*, in all of which the ridges on the spores form regular meshworks.

Whether *R. Frostii* should be retained in the genus *Riccia* or transferred to *Ricciella* is not altogether clear. The green tissue contains intercellular canals which extend, in some cases at least, from the compact ventral tissue to the dorsal surface. Whether they are always continuous for this entire distance, or whether they are occasionally subdivided by transverse or oblique partitions is not brought out by the descriptions. In any case the canals are broader than in typical species of *Riccia*, and instead of being bounded by only four cells in section view are bounded by several to many cells. In these respects they resemble the marginal canals described by Juel [3] in the case of the European *R. Bischoffii* Hüben. Since the median canals in this species are of the narrow type, Juel contends that it shows the *Riccia* structure in the median portion and the *Ricciella* structure in the wings, thus forming a connecting link between the two groups and making it unnecessary to recognize *Ricciella* as a genus. In typical species of *Ricciella*, however, the intercellular spaces are in more than one layer, so that the genus might still be maintained on the basis of this feature. In the case of *R. Frostii*, unfortunately, this criterion can not at present be applied, and it therefore seems wisest to retain the species in *Riccia*, even if certain writers have considered it a *Ricciella*.

[1] Mem. Torrey Club **7**: 32. 1899.
[2] The morphology of *Riccia Frostii*, Aust. Ann. Bot. **27**: 511–532. *pl. 37, 38*. 1913.
[3] Über den anatomischen Bau von *Riccia Bischoffii* Hüb. Svensk Bot. Tidskr. **4**: 160–166. *pl. 7 + f. 1–5*. 1910.

2. Scalia Hookeri (Lyell) S. F. Gray, Nat. Arr. British Pl. **1**: 705. 1821. *Jungermannia Hookeri* Lyell; Sowerby, Engl. Bot. **36**: *pl. 2555*. 1814. *Mniopsis Hookeri* Dumort. Comm. Bot. 114. 1822. *Lejeunea Hookeri* Spreng.; Linnaeus, Syst. Veg. ed. 16, **4**: 234. 1827. *Gymnomitrium Hookeri* Corda; Opiz, Beitr. zur Naturg. 651. 1829. *Mniopsis acutifolia* Dumort. Syll. Jung. 75. 1831. *Haplomitrium Hookeri* Nees, Naturg. der europ. Leberm. **1**: 111. 1833. *H. Cordae* Nees, *l. c.* **1**: 112. 1833. On damp rocks, in a mat of *Pellia Neesiana* (Gottsche) Limpr., Huntington Ravine, Mt. Washington, New Hampshire, about 4800 feet altitude, August 7, 1917 (*A. W. E.*). New to America.

It is a great satisfaction to be able to record this rare and distinct species, representing a monotypic genus, as a member of our flora. Unfortunately the material collected is exceedingly scanty, consisting of a few antheridial shoots, but the plant is so different from all other northern Hepaticae that there is little danger of mistaking it. *S. Hookeri* was supposed to be confined to Europe, where it is widely distributed without being anywhere abundant. It was originally discovered in 1812 by Charles Lyell in the New Forest, Hampshire, England, near the southern coast, and is now known from several other localities on the British Isles and also from Norway, Sweden, Finland, Denmark, Germany and Austria. In the northern part of its range it sometimes descends to the sea level; in the southern part it seems to be confined to higher altitudes. The plants usually grow singly or in small tufts and are difficult to detect in the field. In most cases they occur scattered among other bryophytes, species of *Riccardia* or *Pellia* being perhaps their most common companions.

Full descriptions of *Scalia Hookeri*, many of them accompanied by figures, are available,[1] and the species served as the basis for an important monograph by Gottsche,[2] a work which ranks as a classic in the literature of hepaticology. It is therefore unnecessary to describe the plant in detail. It is hoped, however, that the following brief account of its more distinctive features may prove of interest.

[1] See, for example, the following: Hooker, British Jung. *pl. 54*. 1814; Carrington, British Hep. 1. *pl. 1, f. 1*. 1874; Lindberg, Rev. Bryol. **12**: 33–36. 1885; Pearson, Hep. British Isles, 427. *pl. 189*. 1901; Warnstorf, Kryptogamenfl. der Mark Brandenburg **1**: 134. *f. 1*. 1902; K. Müller, Rabenhorst's Kryptogamen-Flora **6**: 399. *f. 227*. 190 ; Macvicar, Student's Handb. British Hep. 88. *f. 1–8*. 1912; C. Jensen, Danmarks Mosser **1**: 60. *f. 1–3*. 1915.

[2] Anatomisch-physiologische Untersuchungen über *Haplomitrium Hookeri* N. v. E., mit Vergleichung anderer Lebermoose. Nova Acta Acad. Leop.-Carol. **20**: 267–398. *pl. 13–20*. 1843.

The gametophyte consists of a pale subterranean rhizome which branches sparingly and from which the erect leafy shoots arise. Both the rhizome and the leafy shoots are wholly destitute of rhizoids. Slime papillae, however, are produced in abundance. The leafy shoots are mostly 0.5–1 cm. high and are usually unbranched. The leaves are composed of thin-walled cells and vary in shape, some being entire and others variously incised or lobed. The shoots, in the upper part at least, are radial and show no evidence of dorsiventrality; in other words their broad leaves are in more than three ranks and no distinction can be drawn between lateral leaves and underleaves. The lack of dorsiventrality distinguishes *Scalia* from all other genera of the Hepaticae, but in Stephani's opinion [1] this distinction is more apparent than real. According to his observations the leafy shoots are dorsiventral in the lower part, the leaves being in three ranks and showing a differentiation into lateral leaves and underleaves. This differentiation is not one of form or of size but simply of insertion, the lateral leaves being obliquely attached to the stem while the underleaves are transverse. Stephani notes further that the radial structure of the shoot appears only in connection with the sexual organs and that many other leafy genera show a similar approach to a radial condition in their reproductive shoots. However this may be, the shoots of the *Scalia* present a very distinctive appearance and bear a strong resemblance to mosses, their upper leaves being closely crowded.

Most authors assign a dioicous inflorescence to *S. Hookeri*, but Stephani states that it is sometimes monoicous and may be always so. These statements are criticised by Warnstorf and there seems, indeed, to be very little to support them. The antheridia are conspicuous from their large size and bright orange color. They are borne on short stalks and arise irregularly all around the stem, showing no definite relation to the leaves. The archegonia, sometimes as many as ten, are developed near the tip of a shoot, but the apical cell itself does not take part in the formation of an archegonium, even though its activities are brought to an end. No perianth is developed, the protection of the sporophyte being secured by a large and fleshy calyptra, the neck of the fertilized archegonium being in the usual apical position and the unfertilized archegonia remaining at the base.

The sporophyte shows the usual differentiation into foot, stalk and

[1] See Mém. Herb. Boissier **16**: 43. 1900.

capsule, the stalk attaining (according to Lindberg) a length of 1–3 cm. The capsule is oblong-cylindrical, 1.5–2 mm. in length and 0.6–0.75 mm. in diameter. The wall consists of a single layer of cells, except in the apical region, and splits at maturity into four valves, although these may remain more or less united. The cells of the wall are thin-walled, except for a median annular band in each cell, extending longitudinally. This type of thickening recurs in the closely related tropical genus *Calobryum* Nees[1] but otherwise seems to be unique. In all other genera of Hepaticae, where annular or half-annular bands of thickening have been described, the bands run in a general transverse direction. The elaters are for the most part long and bispiral, although some of those which remain attached to the tips of the valves are unispiral throughout more or less of their length. The spores are densely verruculose.

The genera *Scalia* and *Calobryum* constitute a very natural group, to which Goebel[2] has given the name Calobryaceae. This group represents, in the opinion of most writers, the highest development attained by the anacrogynous Jungermanniales. The genus *Calobryum* in fact, as Goebel emphasizes, is not anacrogynous at all, the archegonia forming a definite apical group on the broadened tip of the female shoot. Of course this does not imply that the acrogynous Jungermanniales are descended from the Calobryaceae. The group, as Cavers[3] states, appears "to form a blindly ending line of development," the probable origin of the true Acrogynae being in some less highly differentiated form.

3. Harpanthus Flotowianus Nees, Naturg. der europ. Leberm. **2**: 353. 1836. *Jungermannia Flotowiana* Nees, Flora **16**: 408. 1833. *J. convoluta* Hüben. Hep. Germ. 60. 1834. *J. vogesiaca* Hüben. *l. c.* 149. 1834 (as synonym). *Lophocolea vogesiaca* Nees, Naturg. der europ. Leberm. **2**: 348. 1836. *Pleuranthe olivacea* Tayl. Jour. Bot. **5**: 282. 1846. On damp, earth-covered rocks, mixed with other Hepaticae, Valley Way, Mt. Madison, New Hampshire, about 4700 feet altitude, July 9, 1917 (*A. W. E.*). New to New England.

The present species, which is the type of the genus, was based on material collected in the Riesengebirge, close to the boundary between Silesia and Bohemia. It is now known also from various other parts

[1] See Andreas, Flora **86**: 204. *f. 23, 24.* 1899. [2] Ann. Jard. Buitenzorg **9**: 21. 1891.
[3] New Phytol. Reprint **4**: 99. 1911.

of Germany and Austria, as well as from Norway, Sweden, France and Great Britain. Lindberg and Arnell report it further from various localities in Siberia. For the most part it is alpine or subalpine in its distribution although it sometimes descends to the sea level in the northern part of its range.

In North America its distribution is still very incompletely known. According to the Synopsis Hepaticarum (1845) it was collected by Vahl in Greenland, but there seem to be no other reports about its occurrence on the island. In 1889 Underwood[1] showed that *Pleuranthe olivacea* Tayl., which had been redescribed and figured by Sullivant in the second edition of Gray's Manual (1856), was a synonym of *Harpanthus Flotowianus*. Taylor's species was based on material in the Hooker herbarium, collected by J. Drummond in "North America" and presumably coming from somewhere in western Canada. In 1890 Pearson[2] cited the species vaguely from the "Rocky Mountains (*Bourgeau*)," and Underwood, in his account of the Hepaticae in the 6th edition of Gray's Manual, included *H. Flotowianus*, reproducing Sullivant's figures of *Pleuranthe olivacea*. At the end of the description the words "extra limital" appear, but Underwood[3] repudiated these two years later, stating that they had been added without his knowledge and that he had reason to believe that the species would be found in the northern United States. At the same time he reported it from Labrador (*Waghorne*), the specimens cited having come from Battle Harbor. In 1891 he had already recorded the plant from British Columbia.[4] This record was apparently based on specimens in his herbarium collected by J. Macoun in the "mountains of the Gold Range, north of Griffin Lake," in August, 1889,[5] although no statement to this effect is made. In 1900 the writer[6] detected the *Harpanthus* among the specimens brought back by the Harriman Alaska Expedition and listed the following stations: Hot Spring (*Trelease*), Orca (*Trelease*), Port Wells (*Trelease*), and Yakutat (*Brewer & Coe*). In 1904[7] he reported the

[1] Bot. Gaz. **14**: 196. 1889.
[2] List Canadian Hep. 18. 1890.
[3] The Hepaticae of Labrador. Bull. Torrey Club **19**: 269, 270. 1892.
[4] Zoe **1**: 366. 1891.
[5] See Macoun, Cat. Canadian Pl. **7**: 28. 1902.
[6] Proc. Washington Acad. **2**: 306. 1900. Through an unfortunate oversight *H. Flotowianus* is not mentioned in the writer's recent "Report on the Hepaticae of Alaska," published in Bull. Torrey Club **41**: 577–616. 1915.
[7] Minnesota Bot. Studies **3**: 142. 1903.

species from Grand Marais, Minnesota (*Holzinger*), but this record proves incorrect, the specimens in question representing a large form of *H. scutatus* (Web. f. & Mohr) Spruce. In 1906[1] he reported a new station for the plant from British Columbia, namely: Comox, Vancouver Island (*J. Macoun*). These scanty records seem to exhaust the list, and it will be seen that the stations from Greenland, Labrador, and New Hampshire are the only ones definitely known from eastern North America.

The genus *Harpanthus*, according to our present knowledge, is composed of only two species, *H. Flotowianus* and *H. scutatus*, the latter being widely distributed in northern regions and reaching a much lower latitude than *H. Flotowianus*. The genus is characterized by succubous, bifid leaves; large, lanceolate underleaves, usually undivided although sometimes sparingly toothed; ventral, intercalary branches, those bearing the sexual organs being very short; a rudimentary, erect perigynium, the sporophyte being partially imbedded in the swollen tip of the female branch; small involucral leaves and a short perianth, terete in the lower part. In *H. scutatus* the ventral position of the branches seems to be constant; in *H. Flotowianus* an occasional lateral branch of the *Frullania* type is produced.[2] In its general habit the genus bears a strong resemblance to *Lophocolea* and *Chiloscyphus*. Its systematic position is intermediate between *Heteroscyphus* and *Geocalyx*, both of which have bifid succubous leaves and short sexual branches, ventral in position. In *Heteroscyphus*, however, there is a well-developed perianth and no perigynium (just as in *Lophocolea* and *Chiloscyphus*), whereas in *Geocalyx* there is no perianth and a well-developed perigynium.

Sporophytes are rare in *H. Flotowianus*, but it is usually not difficult to determine sterile material. The conspicuous lanceolate underleaves at once indicate the genus *Harpanthus*, while the somewhat larger size and the blunt lobes of the leaves will serve to separate it from *H. scutatus*. The leaves, to be sure, are subject to considerable variation. The apical sinus, although usually distinct, is sometimes scarcely apparent, while the lobes vary from rounded to more or less acute. Even if acute lobes are present, however, they are in the minority, while the lobes of the leaves in *H. scutatus* seem to be constantly acute. The latter species is further distinguished by the fact

[1] Postelsia 1906: 225.

[2] See Evans, Ann. Bot. **26**: 12. *f. 15.* 1912.

that the underleaves are often coalescent on one side with a leaf; in *H. Flotowianus* they are constantly free. The two species differ finally in habitat. *H. scutatus* prefers logs or dry rocks, rarely ascending to a high altitude, while *H. Flotowianus* grows on damp rocks or in subalpine bogs.

Schiffner[1] recognizes two modifications of the species, which he designates as forma *typica* and var. *uliginosus*, respectively. He admits, however, that they intergrade. In the forma *typica*, to which the Mt. Madison specimens might be referred, the stems are more or less prostrate, and the lobes of the leaves are often sharp. In the var. *uliginosus*, the stems are more or less erect, and the lobes of the leaves are mostly rounded. Forma *typica* grows in somewhat drier localities and occasionally produces reproductive organs; var. *uliginosus* grows in deep swamps and is always sterile. Full descriptions of the species, with figures, may be found in European manuals.

4. Calypogeia fissa (L.) Raddi. On banks, Mt. Washington Carriage Road, New Hampshire, near the three mile post, August 7, 1917 (*A. W. E.*); on shaded earth, Triple Falls, Randolph, New Hampshire, August 23, 1917 (*A. W. E.*); Vineyard Haven, Martha's Vineyard, Massachusetts, August, 1917 (*H. E. Greenwood*). New to New England. In 1907[2] the writer published an account of *C. fissa*, giving a full synonymy of the species. At that time he was able to cite only two stations, namely: Lafayette, Louisiana (*Langlois*), and Devonshire Marsh, Bermuda (*E. G. Britton*). Nichols[3] has since listed the species from Barrasois, Cape Breton, Nova Scotia, and the three following stations may now likewise be placed on record: Magnolia Swamp, Mt. Pleasant, District of Columbia (*M. B. Waite*); Gainesville, Florida (*N. L. T. Nelson*); and Boston Mountains, Swain, Arkansas (*W. H. Emig*). It is clear from these citations that the species is widely distributed in North America. Its range in Europe is equally extensive, and it has also been reported from Japan.

The species is characterized by shortly bidentate leaves and by wide and deeply bifid underleaves, the lobes of which are blunt or sharp and usually bluntly unidentate on the sides. When these features are at all constant, as in the material from Bermuda, the plant is easily distinguished from the closely related *C. Trichomanis* (L.) Corda. Unfortunately this is not always the case. In some

[1] Lotos **48**: 332. 1900. [2] Bryologist **10**: 29. 1907. [3] Bryologist **19**: 42. 1906.

specimens only a few of the leaves are bidentate and the underleaves are sometimes narrower, less deeply divided, and not dentate on the sides. These deviations are more likely to be found on slender branches and apparently indicate a reversionary tendency. At the same time they show that *C. fissa* is to be looked upon as a "kleine Art," even by those who recognize its validity as a species.

The additions to local state floras, not already mentioned on the preceding pages, are as follows: —

For Maine: *Diplophyllum gymnostomophilum*, Round Mountain Lake and vicinity, Franklin County (*A. Lorenz*).

For New Hampshire: *Pellia Fabroniana*, Beaver Falls, Colebrook, and Stewartstown (*A. L. Andrews & A. W. E.*); *Cephalozia macrostachya*, Eagle Lake, Mt. Lafayette (*A. Lorenz*); *Frullania Selwyniana*, Stewartstown and Colebrook (*A. L. Andrews & A. W. E.*); *Lophozia badensis*, Beaver Falls, Colebrook (*A. L. Andrews & A. W. E.*); *L. heterocolpa*, Beaver Falls, Colebrook (*A. L. Andrews & A. W. E.*), and Alpine Cascade, Berlin (*A. W. E.*); *L. Kaurini*, Beaver Falls, Colebrook, and Lime Pond, Columbia (*A. L. Andrews & A. W. E.*); *Anthoceros crispulus*, Cornish (*C. C. Haynes*) and Compton (*A. Lorenz*); *A. Macounii*, Compton (*A. Lorenz*). The specimens of *A. crispulus* from Cornish have already been reported under the name *A. punctatus*[1] and have served as the basis for the record in the writer's Revised List.[2] The sign "+" in the list should therefore be transferred to *A. crispulus*.

For Vermont: *Marsupella Sullivantii*, Mt. Mansfield (*A. Lorenz*).

For Massachusetts: *Cephalozia Francisci*, Granville (*A. Lorenz*); *C. macrostachya*, Woods Holl (*H. E. Greenwood*); *Lophozia inflata*, Sandwich (*G. E. Nichols*) and Stillriver, Harvard (*H. E. Greenwood*); *Nardia crenuliformis*, Granville (*A. Lorenz*); *Radula obconica*, Mt. Washington (*A. Lorenz*); *Scapania dentata*, Sheffield (*A. Lorenz*).

For Connecticut: *Pallavicinia Flotowiana*, Salisbury (*A. Lorenz*); *Sphenolobus exsectaeformis*, Lantern Hill, North Stonington (*A. Lorenz*).

The census of New England Hepaticae now stands as follows: total number of species recorded, 189; number recorded from Maine, 138; from New Hampshire, 149; from Vermont, 129; from Massachusetts, 117; from Rhode Island, 79; from Connecticut, 143; from all six states, 60.

Sheffield Scientific School, Yale University.

[1] Rhodora **7**: 58. 1905.

[2] Rhodora **15**: 26. 1913.

A WHITE-LEAVED HEMLOCK IN VERMONT.— Three years ago when wandering about a hillside pasture near my home in Grafton, Vermont, my attention was attracted by a tree standing some fifteen feet below the woods. A nearer view showed it to be a hemlock about six feet high branching thickly close to the ground and pointed at the top — the tips of all and a large part of some of the branches were whitish while the rest of the tree was of the usual green. This gave it a peculiar variegated appearance. The tree grows on a rather steep side hill; at one side about two feet away is a ledge which rises above the ground over three feet, on the other side and a trifle nearer is a large stone, above and below the land is clear of trees for some distance. It would seem that the soil might not be very deep at this point but I have never investigated. Many hemlocks are in the woods just behind this tree — two large maples are near the foot of the ledge and small trees and bushes are nearby. During these three years I have often been to this pasture and noticed this tree. I do not think there has been much growth but now much of the tree is bleached and only the lower branches give the clear green and white effect. It presents a striking appearance as it stands out clearly against the dark green of the other hemlocks.— AMY M. DAVIS, Grafton, Vermont.

[From Dr. Harold St. John, who has examined specimens of this tree at the Gray Herbarium, we learn that it is clearly the phase described as *Tsuga canadensis* (L.) Carr., *albo-spica* (Barron) Beissner, which has appeared in Europe and been perpetuated there by horticulturalists. It has never before been recorded as occurring in the wild state within the native range of the species.— ED.]

Vol. 19, no. 227, including pages 237 to 256, was issued 5 December, 1917.

ERRATA.

Page 7, line 3; *for* Kangalaksiorvik *read* Kangaluksiorvik.
" 7, " 33; *for* Burnell *read* Burwell.
" 7, " 34; *for* Ehortiarsuk *read* Ekortiarsuk.
" 7, " 35; *for* Narvak *read* Navak.
" 11, " 28; for *Crypta* read *Elatine.*
" 12, " 38; *before* September *insert* Bowdoinham, .
" 13, " 8 & 9; *for* Andelusia *read* Andalusia.
" 15, " 22; *for* West *read* above.
" 27, " 12; shift line to the left even with line 8.
" 32, " 25; for *maritimum* read *maritima.*
" 33, " 32; *for* Barrett *read* Barratt.
" 51, " 34; *for* A. R. Weed *read* A. C. Weed.
" 53, " 27; *for* Buchnell's *read* Bushnell's.
" 54, " 6; *after* 1916 *insert* By M. S. Baxter.
" 57, " 9; *for* ophioides *read* OPHIOIDES.
" 101, " 40; *for* Homerstown *read* Hornerstown.
" 102, " 1; *for* W. G. & *read* W. J. &.
" 102, " 3; for *Lippencott* read *Lippincott.*
" 102, " 5; *omit* vicinity of.
" 102, " 37; *for* costal *read* coastal.
" 104, " 11; for *R. B. Bartram* read *E. B. Bartram.*
" 104, " 12 & 25; *omit* Jr.
" 104, " 24; for *Conard* read *Conrad.*
" 105, " 1; *for* coast *read* coastal.
" 110, " 29; for *Picia* read *Picea.*
" 122, " 35; *for* C. *read* CAREX.
" 144, " 21; *for* 826 *read* 827.
" 178, " 37; for *thelipterioides* read *thelypterioides.*
" 178, " 37; for *thelipteroides* read *thelypteroides.*
" 189, " 22; *for* Swamp *read* Stump.
" 201, " 36; for *Filix-temina* read *Filix-femina.*
" 210, " 42; *for* Betchouam *read* Betchouane.
" 210, " 42; *for* Seignoiry *read* Seigniory.
" 215, " 29; for *cicutaria* read *cicutarium.*
" 227, " 37; for *? read *×?
" 252, " 35; for SILYBIUM MARIANUM read SILYBUM MARIANUM.

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